

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Project PL 0100(91) 3616 P, PCN 033D

Prepared for:



**South Dakota Department of Transportation
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Table of Contents

1.0 Executive Summary1

2.0 Introduction and Background1

3.0 Methods and Procedures Summary5

4.0 Existing Conditions and Year 2035 No-Build Conditions6

 Traffic Volumes and Operations.....6

 Level of Service Considerations7

 Crashes.....7

 Driveways and Minor Intersections7

5.0 Interchange Options17

 Partial Cloverleaf Interchange17

 Single Point Interchange17

 Diverging Diamond Interchange.....17

 Concept Options Comparison17

 Consultant Recommended Option17

 Interchange Aesthetic Concepts.....17

6.0 Corridor Improvement Options.....25

 Segment 1 – 41st Street from Valley View Road to Marion Road.....26

 Segment 2 – 41st Street from Marion Road to I-29.....32

 Segment 3 – 41st Street from I-29 to Louise Avenue.....37

 Segment 4 – 41st Street from Louise Avenue to Kiwanis Avenue48

 Segment 5 – Louise Avenue from 49th Street to 41st Street.....56

 Segment 6 – Louise Avenue from 41st Street to 34th Street.....58

7.0 Public Involvement60

8.0 Pedestrian, Bicycle, and Transit Considerations.....64

9.0 Consultant Recommended Improvement Options Summary68

10.0 Implementation Phasing and Funding Responsibility68

11.0 Summary and Next Steps.....68

Appendices.....70

 A – Carolyn Avenue Access Analysis Memoranda

 B – Public Involvement

 April 12, 2011 Public Meeting

 April 18 and 20 Business/Landowner Group Meetings

 September 21 Public Meeting

 September 27 and 28 Business/Landowner Group Meetings

 Individual Landowner Meetings

 March 21, 2012 Public Meeting

 C – Crash Memo

 D – SYNCHRO® Signalized Intersection Analysis Printouts

List of Figures

Figure 2-1 Project Area 3

Figure 2-2 Timeline for I-29 Upgrades..... 3

Figure 2-3 Study Corridor Roadways and Segments..... 4

Figure 4-1a Existing Conditions – Valley View Road to I-29..... 8

Figure 4-1b Existing Conditions – I-29 to Kiwanis Avenue 9

Figure 4-2a Signalized Intersection Traffic Counts and Daily Traffic Volumes..... 10

Figure 4-2b Existing Balanced Traffic Volumes and Signalized Intersection LOS 11

Figure 4-2c 2035 Traffic Volume Projections and Signalized Intersection LOS – No Build 12

Figure 4-3 Crash Analysis Summary Graphic..... 13

Figure 4-4a Driveway and Minor Intersections, Valley View – I-29 14

Figure 4-4b Driveway and Minor Intersections, I-29 – Kiwanis 15

Figure 4-4c Driveway and Minor Intersections, 49th – 34th 16

Figure 5-1 Partial Cloverleaf Interchange Option 19

Figure 5-2 Single Point Interchange Option 20

Figure 5-3 Diverging Diamond Interchange Option..... 21

Figures 5-4 to 5-6 Interchange Landscaping and Aesthetic Options 22

Figure 6-1A 41st Street from Valley View Road to Marion Road Improvement Option A..... 29

Figure 6-1B 41st Street from Valley View Road to Marion Road Improvement Option B 30

Figure 6-1C 41st Street from Valley View Road to Marion Road Improvement Option C 31

Figure 6-2A 41st Street from Marion Road to I-29 Improvement Option A..... 34

Figure 6-2B 41st Street from Marion Road to I-29 Improvement Option B 35

Figure 6-2C 41st Street from Marion Road to I-29 Improvement Option C 36

Figure 6-3A 41st Street from I-29 to Louise Avenue Improvement Option A..... 41

Figure 6-3B 41st Street from I-29 to Louise Avenue Improvement Option B 42

Figure 6-3C 41st Street from I-29 to Louise Avenue Improvement Option C 43

Figure 6-3D 41st Street from I-29 to Louise Avenue Improvement Option D..... 44

Figure 6-3E 41st Street from I-29 to Louise Avenue Improvement Option E 45

Figures 6-3F and 6-3G Carolyn Avenue Access Options..... 46

Figure 6-4A 41st Street from Louise Avenue to Kiwanis Avenue Improvement Option A..... 51

Figure 6-4B 41st Street from Louise Avenue to Kiwanis Avenue Improvement Option B 52

Figure 6-4C 41st Street from Louise Avenue to Kiwanis Avenue Improvement Option C 53

Figure 6-4D 41st Street from Louise Avenue to Kiwanis Avenue Improvement Option D..... 54

Figure 6-4E 41st Street from Louise Avenue to Kiwanis Avenue Improvement Option E 55

Figure 6-5 Louise Avenue at 49th Street Improvement Option..... 57

Figure 6-6 Louise Avenue from 41st Street to 34th Street Improvement Options 59

Figure 7-1 and 7-2 Public Meeting and Business/Landowner Notification Areas 62

Figure 8-1 Pedestrians, Bike Routes and Transit Operations 67

Figure 9-1 Implementation Timeframe and Funding Responsibility..... 69

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1.0 Executive Summary

The 41st Street interchange on Interstate 29 (Exit 77) and the adjacent 41st Street and Louise Avenue corridors comprise an area with some of the highest traffic volumes and most significant congestion in South Dakota. The public agencies with responsibility in the area are seeking to find solutions to the congestion through the analysis in this study.

Data on existing traffic conditions was gathered and analyzed, forming a basis for understanding the depth and complexity of current traffic operations. Forecasts were created for traffic conditions in year 2035 and were used to develop concept options for future traffic improvements. These alternatives were then further analyzed to determine which may provide the best combination of traffic operations, safety and cost.

The public was involved throughout the study through public meetings, landowner meetings, and a project website. Public comments, provided in person, in writing, or electronically, were used in development and refinement of improvement alternatives. The project's Study Advisory team consisted of representatives from FHWA, SDDOT, MPO, the City of Sioux Falls, and HDR.

Some of the significant findings of the study include:

- Traffic volumes on 41st Street west of I-29 are expected to increase by 25% to 50% by year 2035 due to continued development on the west side of Sioux Falls.
- Traffic volumes on 41st Street east of I-29 are expected to increase by approximately 10% by year 2035. This minor increase is because the area is nearly fully developed. However, traffic congestion is currently severe during peak periods so any increase in traffic will cause a noticeable increase in congestion.
- Expansion of 41st Street from 2 through lanes in each direction to 3 lanes in each direction west of I-29 is necessary to accommodate expected traffic volumes.
- Expansion of the 41st Street/Marion Road intersection to include dual left turn lanes and right turn lanes at all approaches is necessary to provide an acceptable level of service.
- Converting the I-29/41st Street interchange to a diverging diamond configuration would improve operations at a reasonable cost when compared with other interchange options.
- Converting West Empire Place and Shirley Avenue to a system of one-way roadways for access to and from the Empire Mall would improve traffic flow on 41st Street between I-29 and Louise Avenue.
- Additional through traffic lanes are not necessary on 41st Street east of I-29; the existing 3 lanes in each direction are adequate.
- Significant widening of 41st Street to provide additional turning lanes would have significant impacts to adjacent commercial properties. A two-level structure called a Center Turn Overpass intersection at 41st and Louise may provide significant operational improvement without significantly impacting the adjacent commercial properties. The cost of the Center Turn Overpass is a concern.
- A left-turn flyover ramp at 41st and Kiwanis would significantly improve operations. Cost of the ramp is a concern.
- Selected use of raised medians and access modifications would improve safety on 41st Street.
- Needed improvements on Louise Avenue are limited to the 49th Street intersection and the Walmart entrance.

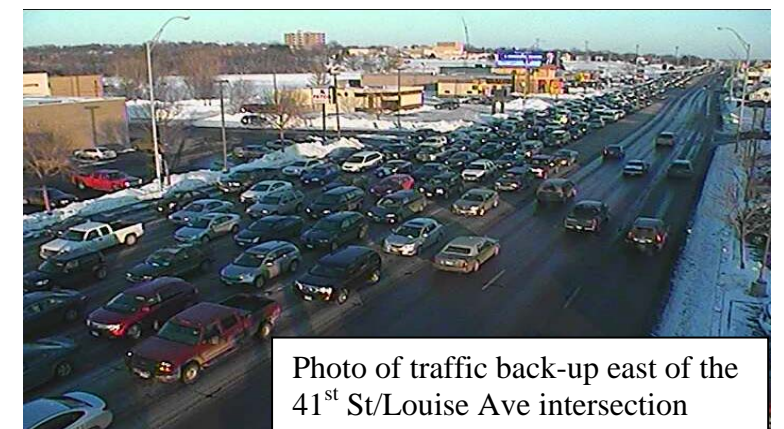
2.0 Introduction and Background

The commercial area surrounding the interchange on Interstate 29 at 41st Street in Sioux Falls is one of the busiest spots in South Dakota. The Empire Mall consistently ranks among the state attractions that draws the most visitors, while the other retail sites in the vicinity compound the attractiveness of this commercial neighborhood. One effect of this commercial activity is high traffic demand on 41st Street and at the I-29 interchange.



There are also large commuter traffic demands in addition to the commerce-related traffic. Many drivers who live in southwest Sioux Falls use 41st Street and I-29 to travel to work, school, and other activities each day. Figure 2-1 shows the Project Area within the City of Sioux Falls.

The result of these demands is that 41st Street is arguably the busiest street in South Dakota, rivaling the traffic levels found in many larger cities. Long traffic queues are routinely found at some signalized intersections along 41st Street and the interchange ramps have been known to back up onto the through-traffic lanes of Interstate 29. The levels of congestion surrounding the 41st



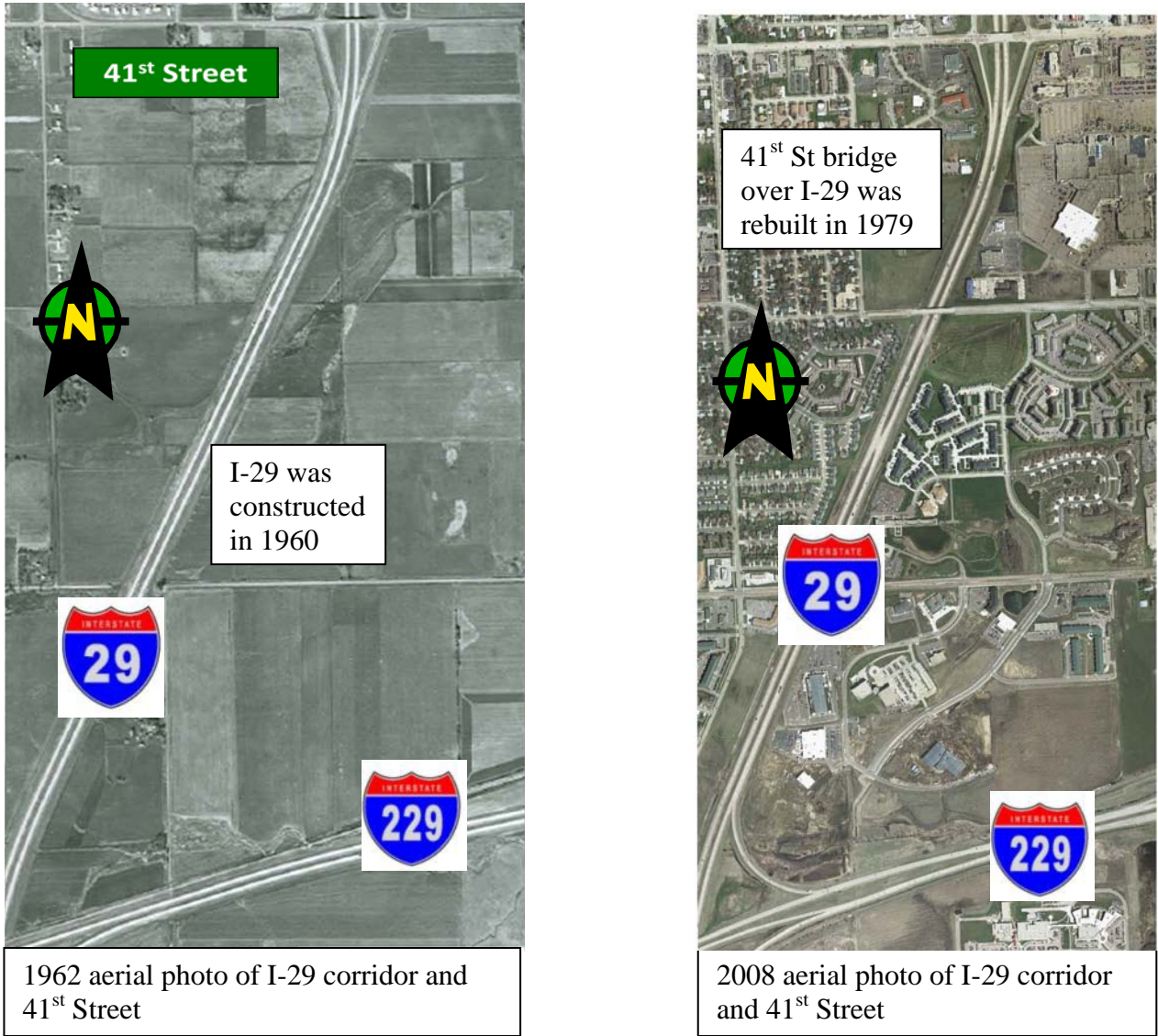
Street interchange and extending along 41st Street and Louise Avenue are not considered sustainable. They impose considerable costs on the traveling public in terms of lost time, fuel usage, and traffic crashes.

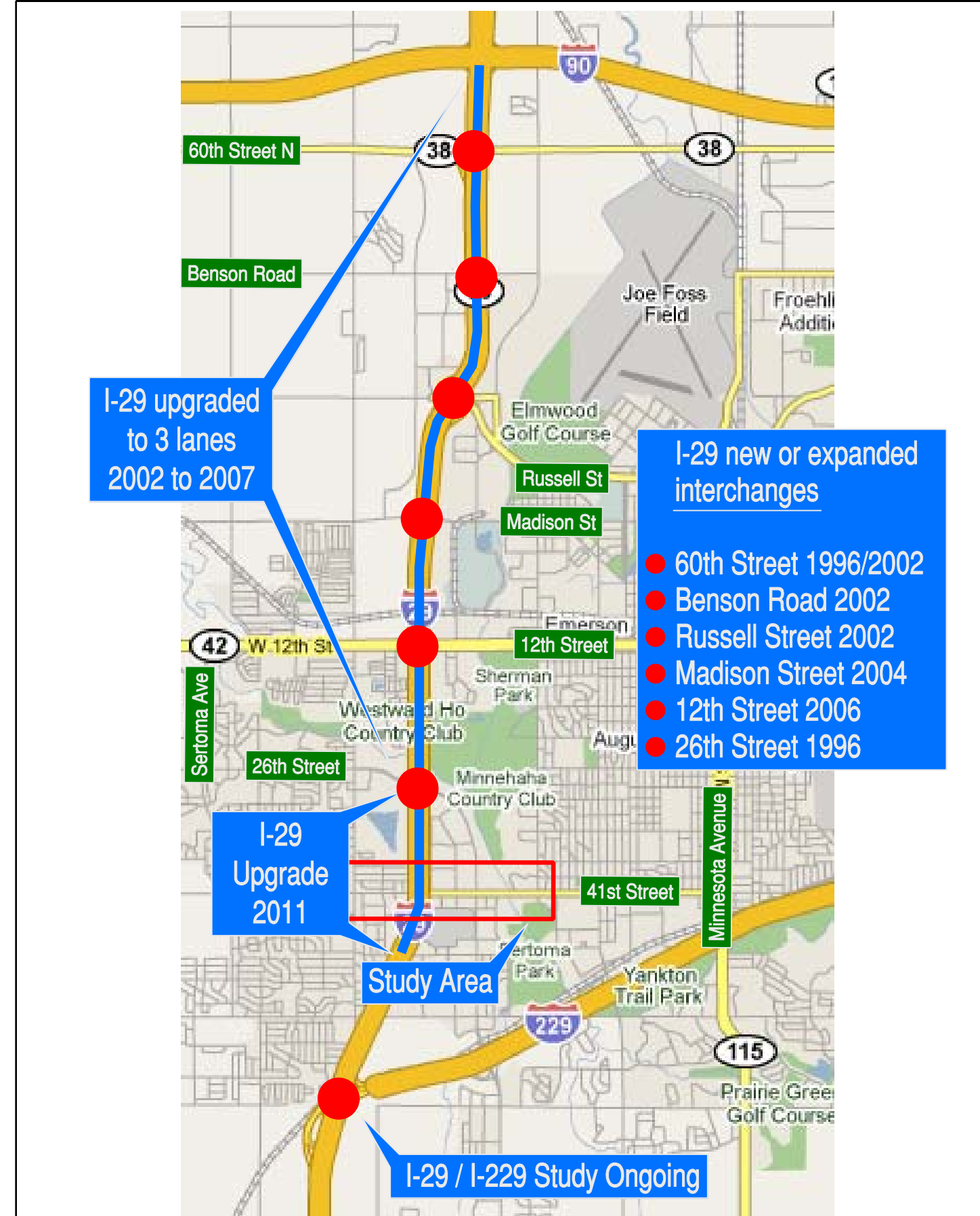
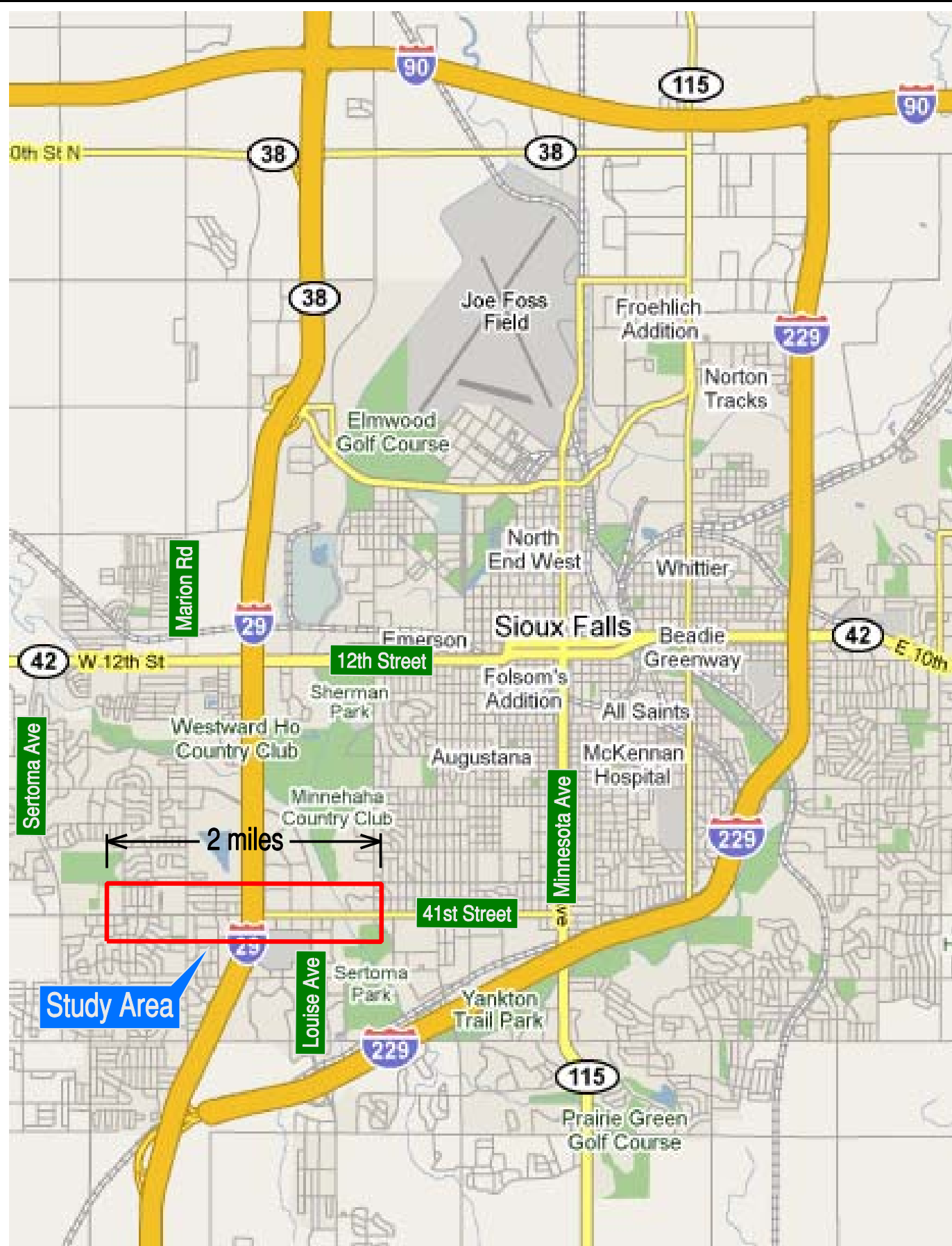
The South Dakota Department of Transportation (SDDOT), the Federal Highway Administration (FHWA), the City of Sioux Falls, and the Sioux Falls Metropolitan Planning Organization (MPO) have jointly taken steps to find solutions to these congestion problems through this study. The goal of the study is to consider improvements to the interchange and to the 41st Street and Louise Avenue corridors that will allow traffic to flow more efficiently and more safely through the current planning horizon (year 2035). These same agencies have worked together to upgrade the I-29 corridor as the areas along the I-29 and 41st Street corridors have transformed from rural to fully urbanized areas. The photos below illustrate this transformation.

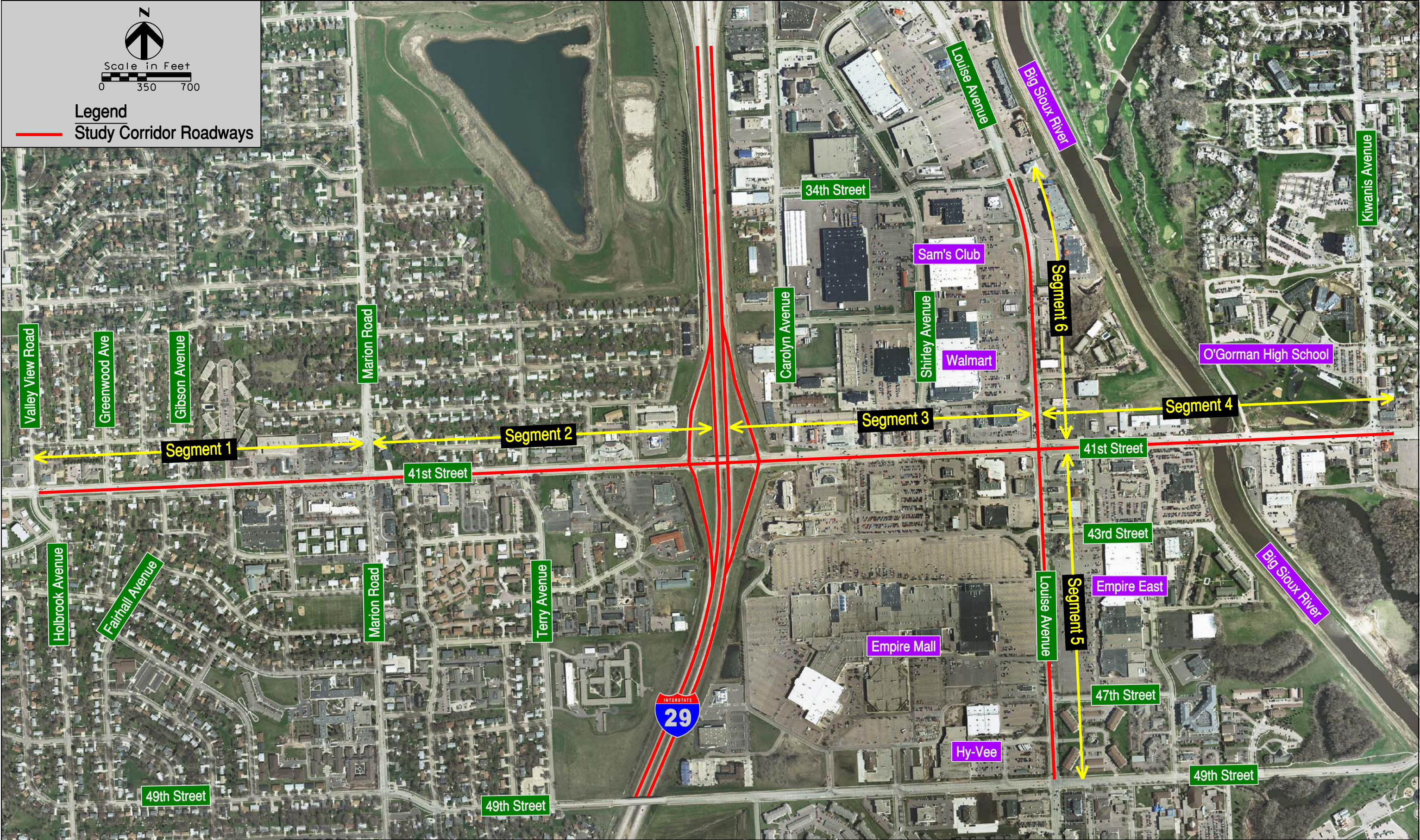
Since the mid-1990's, especially, these agencies have worked together to upgrade I-29 all along the west side of the City of Sioux Falls in an effort to meet the growing traffic demand. Figure 2-2 depicts the various improvements that have been completed along the I-29 corridor since 1995. As shown on Figure 2-2, the I-29/41st Street interchange is the last of the I-29 interchanges to be studied and is indicative of the methodical process involved in the upgrade of a transportation facility such as an Interstate Highway.

This report documents the development of improvement concepts, technical analysis, and public involvement that was undertaken during the study. An implementation phasing plan for the transportation improvements has been provided in the last section of the report.

Figure 2-3 shows the specific roadways considered in the I-29 Exit 77 (41st Street) Crossroad Corridor Study.







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Study Corridor Roadways and Segments

I-29 Exit 77 (41st Street) Crossroad Corridor Study Sioux Falls, SD

Figure
2-3

3.0 Methods and Procedures Summary

Overall Process

The conduct of the study followed this general workflow:

1. Gather traffic data including link volumes, turning movements, driveway counts, crash statistics, lane configurations, signal timings, etc.
2. Develop balanced intersection turning movement volumes for existing conditions from the various intersection counts and City of Sioux Falls yearly tube counts.
3. Analyze the existing traffic operations.
4. Present the results of the existing conditions analysis to the public and solicit input on problems and needs within the corridor. This step was completed in the April 2011 public and business/landowner meetings.
5. Forecast future (year 2035) traffic demand and analyze future conditions without improvements (no-build condition).
6. Develop concepts for improving the interchange configuration.
7. Develop concepts for improving arterial corridors.
8. Analyze future conditions with the interchange and arterial concepts.
9. Present the interchange and arterial concepts to the public and solicit input. This step was completed in the September 2011 public and business/landowner meetings.
10. Document the benefits and drawbacks of the improvement options.
11. Document the study analysis in a draft report.
12. Determine the consultant recommended options.
13. Present the analysis and recommendations to the public and solicit input. This step was completed in the March 2012 public meeting.
14. Create a final study report.

Data Sources

Much of the data for the study was provided from the extensive databases maintained by SDDOT and the City of Sioux Falls. The available data was supplemented with new counts conducted by the City and other data gathered by HDR.

Traffic Analysis

Existing traffic operations were analyzed using Highway Capacity Manual procedures contained in SYNCHRO[®] version 7.0 software package. A traffic micro-simulation model was created and calibrated using VISSIM[®] to verify the SYNCHRO[®] operations findings. The Diverging Diamond Interchange (DDI) concept was analyzed using VISSIM[®] microsimulation for two primary reasons: 1) HCS-related software such as SYNCHRO[®] has difficulty accepting the geometric and operational conditions involved with a DDI, and 2) Only microsimulation can capture the complex vehicle interactions involved with a DDI. Traffic animations provided in this study were from the VISSIM[®] micro-simulation model. These animations represent year 2035 traffic conditions for the specific option under consideration. The VISSIM[®] animations are mainly illustrative but can be used for analysis purposes, as well.

Future traffic levels were predicted using the regional travel demand model maintained by the City of Sioux Falls. Future traffic operations were analyzed using the same analysis techniques as the existing conditions analysis.

Crash Analysis

Crash statistics were compared to critical rates for similar facilities in Sioux Falls and any safety-related improvements were identified for inclusion in the interchange and arterial concepts.

Improvement Options

Interchange and arterial improvement concepts were developed based on the particular needs within the study area, with reference to pertinent design standards and professional knowledge regarding the effectiveness of each alternative. The basic goals of each improvement option were to:

- Provide level of service D or better at signalized intersections for year 2035 traffic conditions
- Improve safety along corridor roadways for vehicles and pedestrians
- Maintain reasonable access to properties adjacent to corridor roadways
- Improve pedestrian facilities along corridor roadways
- Minimize property impacts resulting from right-of-way acquisition and/or access restriction
- Meet applicable design standards for the roadways and pedestrian facilities

Public Input

Public input was solicited throughout the study process and played an important role in development of alternatives and selection of the most technically feasible improvement concepts.

Technically Feasible Option(s)

An initial goal of the corridor study was to select one or more technically feasible options for each segment of the study area. However, it soon became apparent that all of the options developed for the corridor study had benefits and drawbacks and were in some measure technically feasible. Selection of a preferred option for each segment of the study area will be the result of:

- An Interchange Modification Report for the I-29/41st Street interchange, and
- An environmental analysis for each individual project identified for funding and construction. The National Environmental Policy Act and accompanying provisions will be followed for any environmental analysis. Figure 9-1 shows the anticipated individual projects for study area roadways and the timeframe for each of the projects.

Due to right-of-way limitations along the study corridor roadways, it must be recognized that options may be considered technically feasible even if the various traffic, safety, pedestrian, etc. goals are not achieved. In these cases, the options need to be compared with No-Build Conditions.

Consultant Recommended Option

After discussion of the benefits and drawbacks of the various interchange and corridor improvement options, a Consultant Recommended Option is identified as well as the basis of that recommendation. The Consultant Recommended Option may or may not be the eventual preferred option identified through the Interchange Modification Report and/or environmental analysis process.

4.0 Existing and Year 2035 No-Build Conditions

The 41st Street interchange on I-29 and the 41st Street and Louise Avenue corridors currently experience peak period congestion, with associated traffic delay and queues. In fact, the congestion has grown to the point that some residents avoid patronizing the businesses in the study area in favor of other businesses that have more convenient travel patterns. Details of the existing condition analysis are provided in the following sections. Figures 4-1a and 4-1b illustrate the existing I-29 and 41st Street roadway corridors via aerial photos.

Traffic Volumes and Operations

Traffic count data (Figure 4-2a)

Figure 4-2a shows:

- Peak hour signalized intersection turning movement counts taken by SDDOT and the City of Sioux Falls over a period of several years. The intersection turning movement counts represent a “snapshot” of traffic volumes at an intersection for the particular day and time period of the count. The counts are conducted when traffic conditions are considered average, in effect, when there are no events and/or construction projects that would skew the counts at the intersection. A complete re-count of all signalized intersections within the study area was not considered necessary for this corridor study.
- Average Annual Daily Traffic (AADT) volumes averaged from the City’s 2005 through 2009 published count book. The average daily traffic volumes at the west end of the 41st Street corridor are the lowest within the study area, building to the east and reaching a peak of over 40,000 vehicles per day between Louise Avenue and Kiwanis Avenue. The street section between Louise Avenue and Kiwanis Avenue has experienced seasonal peak daily traffic reaching nearly 70,000 vehicles per day in the past. General east/west traffic volumes have risen about 2% per year in the developed part of Sioux Falls, but traffic volumes along 41st Street have risen and fallen over the last 20 years as other parallel routes, such as 12th Street, 26th Street, 49th Street and 57th Street have been improved. Traffic volumes recorded in 2010 are actually slightly less than volumes recorded in 2002 because of efforts to increase capacity on other routes and drivers adjusting their travel patterns to utilize these parallel routes where traffic may flow more smoothly.

Existing Balanced Traffic Volumes and Intersection Level of Service (Figure 4-2b)

The intersection traffic counts shown in Figure 4-2a were utilized to determine balanced turning movements at signalized intersections. The traffic balancing process involves adjustments in the traffic count data to:

- Ensure that the same volume of traffic leaving one intersection enters the next intersection
- Compensate for the varying timeframe of the turning movement counts.

Balancing involves the adjustment of volumes through the Fratar Method and weighted averaging techniques to produce a coherent set of volumes throughout a corridor.

Intersection level of service and average vehicle delay for existing (defined as year 2011) conditions were determined from these balanced traffic volumes utilizing SYNCHRO[®] 7.0 software. SYNCHRO[®] also provides a tool for balancing intersection volumes and it provides for input of other intersection-related data. The Highway Capacity Manual signalized intersection report produced by SYNCHRO[®] was used as output from the level of service analysis process and provided information for display in report figures. Existing

signal timings, peak hour factors and other known parameters were entered for the existing conditions scenarios. Printouts from the SYNCHRO[®] analysis are included in Appendix D of this report.

Year 2035 Projected Traffic Volumes and No-Build Intersection Level of Service (Figure 4-2c)

Figure 4-2a shows:

- Predicted year 2035 A.M and P.M. peak hour turning movements at signalized intersections. These volumes were developed using the City’s regional travel demand model.
- Predicted year 2035 AADT. The regional travel demand model was also utilized to develop these volumes.
- Intersection level of service for year 2035 traffic conditions assuming that no capacity increases will be made on any of the study area roadways. This No-Build condition is the basis of comparison with existing conditions and with any potential improvement options. For this corridor study, signalized intersections with a No-Build year 2035 level of service E or F warranted development of improvement options.

In general, traffic volumes east of I-29 are expected to increase approximately 10 percent from existing to year 2035. Traffic volumes west of I-29 are expected to increase between 25 percent and 50 percent from existing to year 2035 conditions.

Year 2035 intersection analysis involved the use of SYNCHRO[®] default parameters since these conditions are unknown under future operating conditions and the default parameters provide a basis for comparing operations between scenarios. Critical movements were not analyzed in the SYNCHRO[®] intersection analyses, but long queues and intersection-to-intersection interactions were identified through microsimulation and led to alteration of some of the intersection configurations. Printouts from the SYNCHRO[®] analysis are included in Appendix D of this report.

The traffic analysis shows continued traffic growth and deterioration in traffic operations in the coming years. The anticipated future congestion provides the foundation for seeking improvements at the I-29/41st Street interchange and throughout the corridor.

Table 1 Signalized Intersections Needing Improvement (based on P.M. Peak Hour)

Intersection	Existing (P.M. Peak Hr)		Year 2035 No-Build (P.M. Peak Hr)	
	LOS	Avg. Delay (seconds)	LOS	Avg. Delay (seconds)
41 st Street/Valley View Rd	C	21	E	78
41 st Street/Marion Road	D	53	F	319
41 st Street/I-29 SB	F	86	F	351
41 st Street/I-29 NB	E	67	F	307
41 st Street/W Empire Pl	D	41	F	135
41 st Street/Louise Avenue	F	86	F	183
41 st Street/Kiwanis Ave	F	104	F	123
Walmart/Louise Avenue	D	37	E	65
49 th Street/Louise Avenue	E	62	F	116

Level of Service Considerations

Observations of traffic volumes provide an understanding of the general nature of traffic, but are insufficient to indicate either the ability of the street network to carry additional traffic or the quality of service provided by the street system. For this reason the concept of *level of service* (LOS) was developed to correlate numerical traffic operational data to subjective descriptions of traffic performance at intersections. Each lane of traffic has delay associated with it and therefore a correlating LOS. The weighted average delay for each of these lanes of traffic for a signalized intersection is the intersection LOS. LOS categories range from LOS “A” (best) to “F” (worst) as shown in Table 2.

Table 2 Level of Service Description

Level of Service	Delay at Signalized Intersection (sec)	Delay at Unsignalized Intersection (sec)	Intersection LOS Description
A	< 10.0	< 10.0	Free flow, insignificant delays.
B	10.1-20.0	10.1-15.0	Stable operation, minimal delays.
C	20.1-35.0	15.1-25.0	Stable operation, acceptable delays.
D	35.1-55.0	25.1-35.0	Restricted flow, regular delays.
E	55.1-80.0	35.1-50.0	Maximum capacity, extended delays. Volumes at or near capacity. Long queues form upstream from intersection.
F	> 80.0	> 50.0	Forced flow, excessive delays. Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

Source: *Highway Capacity Manual*, Transportation Research Board, 2000

The intersection capacity analyses were completed with Synchro 7.0 software. Synchro replicates the analysis procedures defined in the latest version of the *Highway Capacity Manual*. This manual provides procedures for the analysis of both signalized and unsignalized intersections. It should be noted that stop-controlled intersections are analyzed by identifying the amount of delay at each approach that conflict with other intersection movements (i.e. all movements except the free flow thru lanes), thus approach LOS is reported for unsignalized intersections.

The Sioux Falls Street Design Standards section 5.1.2.8 says, “Existing corridors with established adjacent development shall be designed to LOS D.” Likewise, the South Dakota Department of Transportation Design Manual Table 15-1, “Level of Service Guidelines”, indicates that for arterial and collector streets, LOS C is desirable and LOS D is considered the minimum acceptable. For this study, LOS “D” for the overall intersection was used as the minimum standard for improvement options.

Crashes

Crash data from the State of South Dakota was reviewed and analyzed to determine the crash characteristics within the study area, as well as the need for any safety-related improvements. Figure 4-3 shows a plot of the crash locations reported in 2007-2009 with summaries of the crash types at the major intersections.

A technical memorandum was prepared which provides details of the crash analysis. That technical memorandum is included in Appendix C for reference. The technical memorandum found that the following intersections are operating at crash rates higher than their respective critical rates:

- 41st/Valley View
- 41st/Marion Road
- 41st/Empire Place
- 41st/Shirley Avenue
- 41st/Louise Avenue
- Empire Place/Louise Avenue

Recommendations for safety-related improvements include:

- Reduce queues and apply access management to reduce crashes in congested sections, particularly 41st Street from Terry Avenue to Kiwanis Avenue.
- Reconfigure I-29/41st Street interchange to add turning capacity and reduce queues.
- Add capacity at other intersections, especially turn lanes.
- Introduce a median in the sections of 41st Street planned for six through-lanes to reduce the most hazardous movements.
- Consolidate and eliminate driveways where possible.

Driveways and Unsignalized Intersections

The density of access points along 41st Street and Louise Avenue have contributed to congestion and safety problems. Any corridor-wide improvements, therefore, need to address access management issues. Figures 4-4a through 4-4c show an inventory of the existing driveways and unsignalized intersections along the corridors. Recommended actions for each driveway are shown based on City of Sioux Falls access standards and principles of retrofitting access management to developed corridors. Traffic counts and levels of service for several unsignalized intersections are provided as background information for consideration of corridor and interchange improvements. The level of service at any stopped approach on a major arterial street corridor like 41st Street is likely to be “F” in the peak hours. This is a condition that should be remedied by attention to providing alternative access to allow drivers to reach a traffic signal for access to the arterial street. A number of alternative access roadways are shown on the corridor improvement alternatives later in this report.

The minor intersections at Meadow Avenue and Carolyn Avenue will likely be affected by their proximity to the I-29 interchange. The interchange and corridor alternatives show that access at these locations may be altered to facilitate the function of the interchange. A separate analysis was conducted for the 41st Street/Carolyn Avenue intersection. The technical memoranda documenting the analysis are provided in Appendix A. In essence, five different access options have been developed, each with benefits and drawbacks. All of the options will be analyzed in greater detail in an upcoming Interchange Modification Report and accompanying environmental analysis.



Date of Airplane Photos: 10/14/2011
Date of Aerial Photography: 2008

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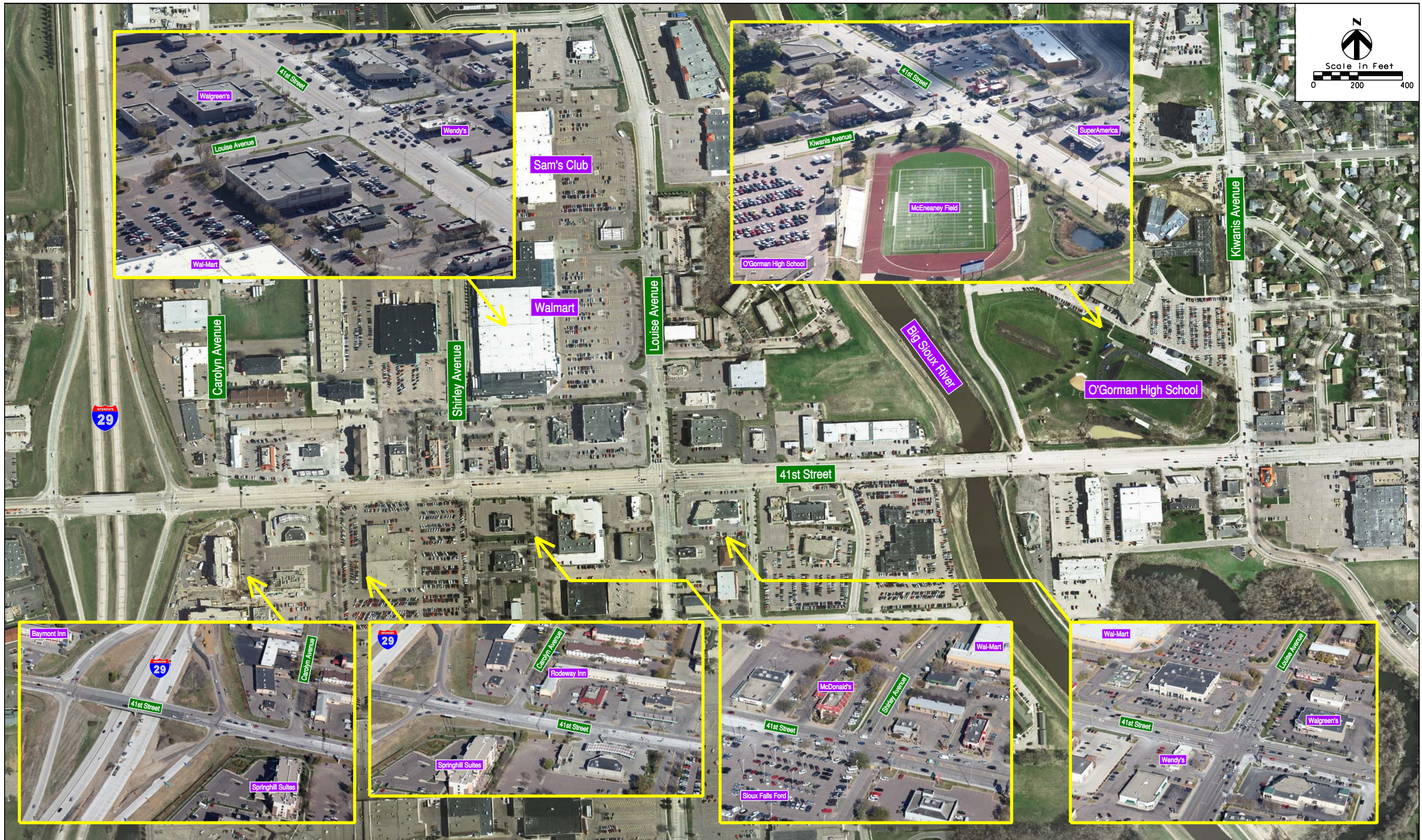


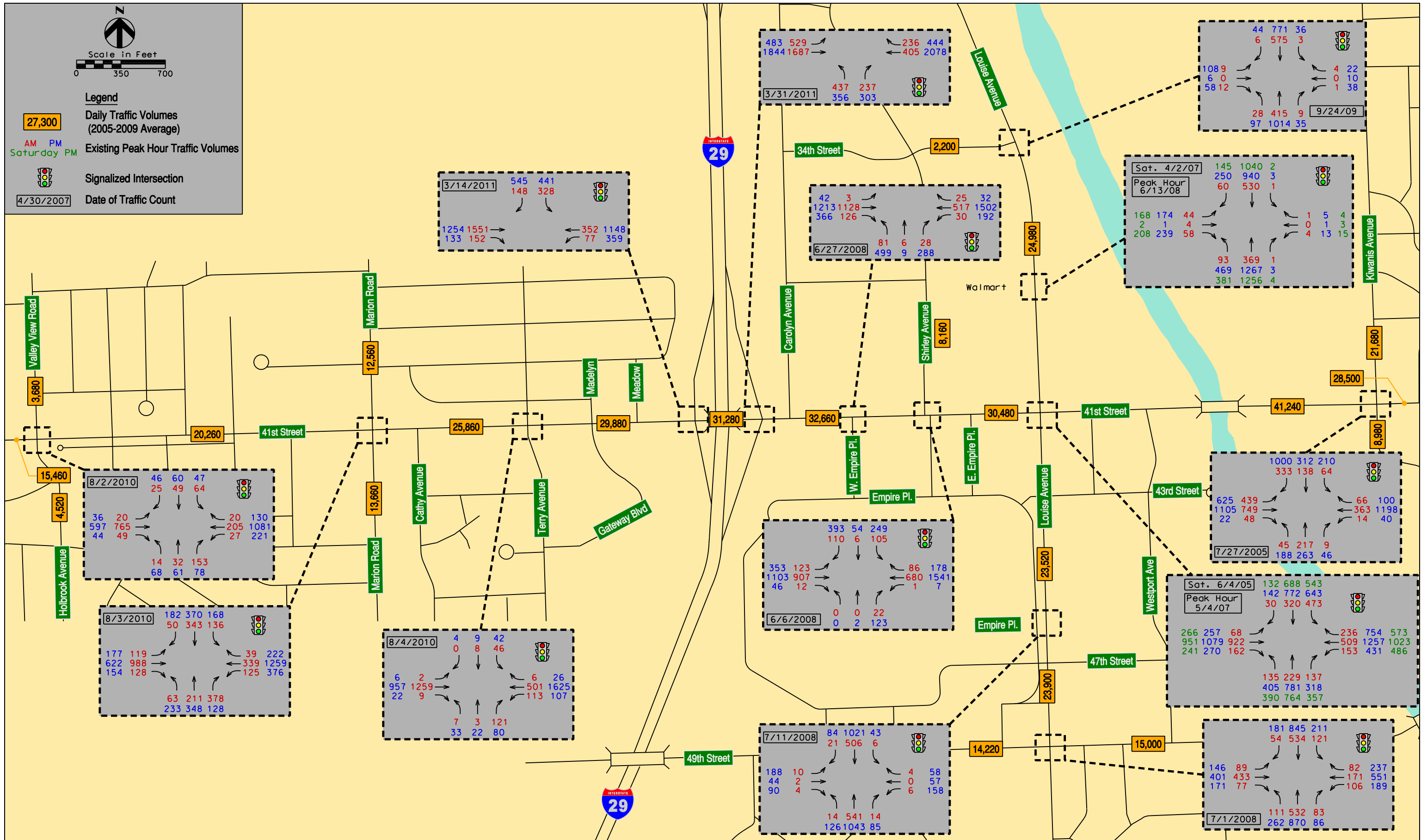
Existing Conditions - Valley View Road to I-29

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

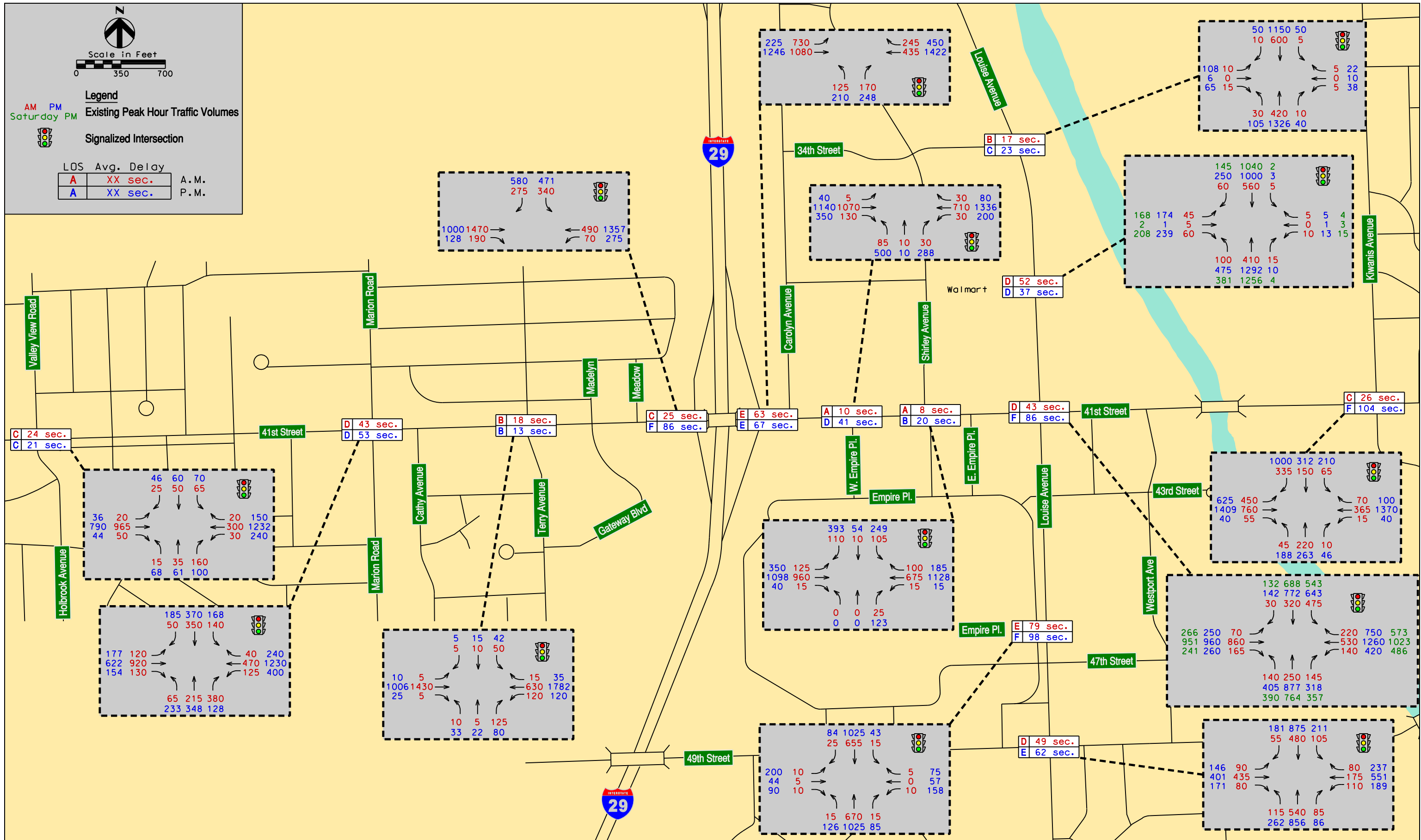
Figure
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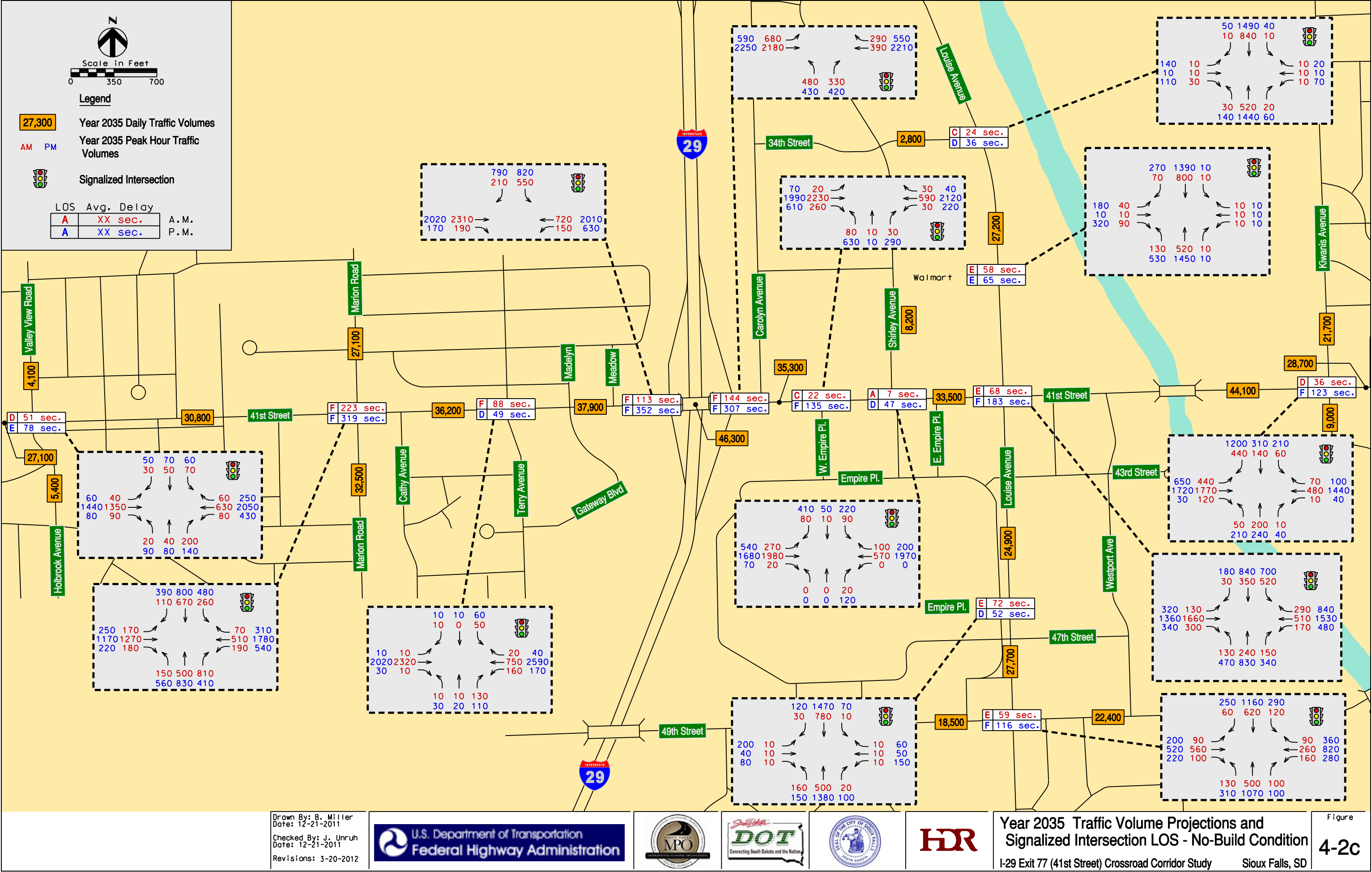


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**Existing Balanced Traffic Volumes
and Signalized Intersection Level of Service**
I-29 Exit 77 (41st Street) Crossroad Corridor Study
Sioux Falls, SD

Figure
4-2b



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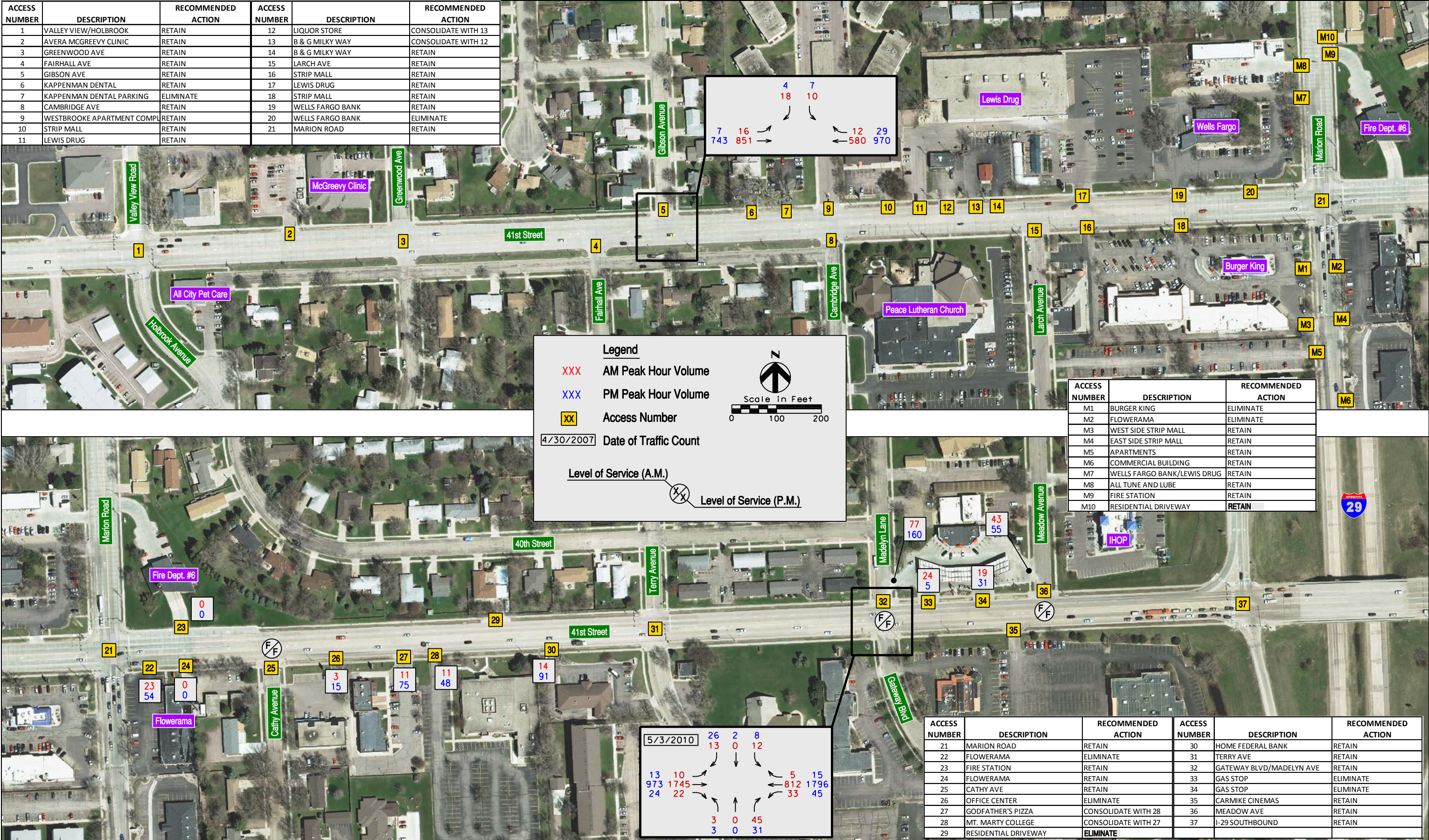


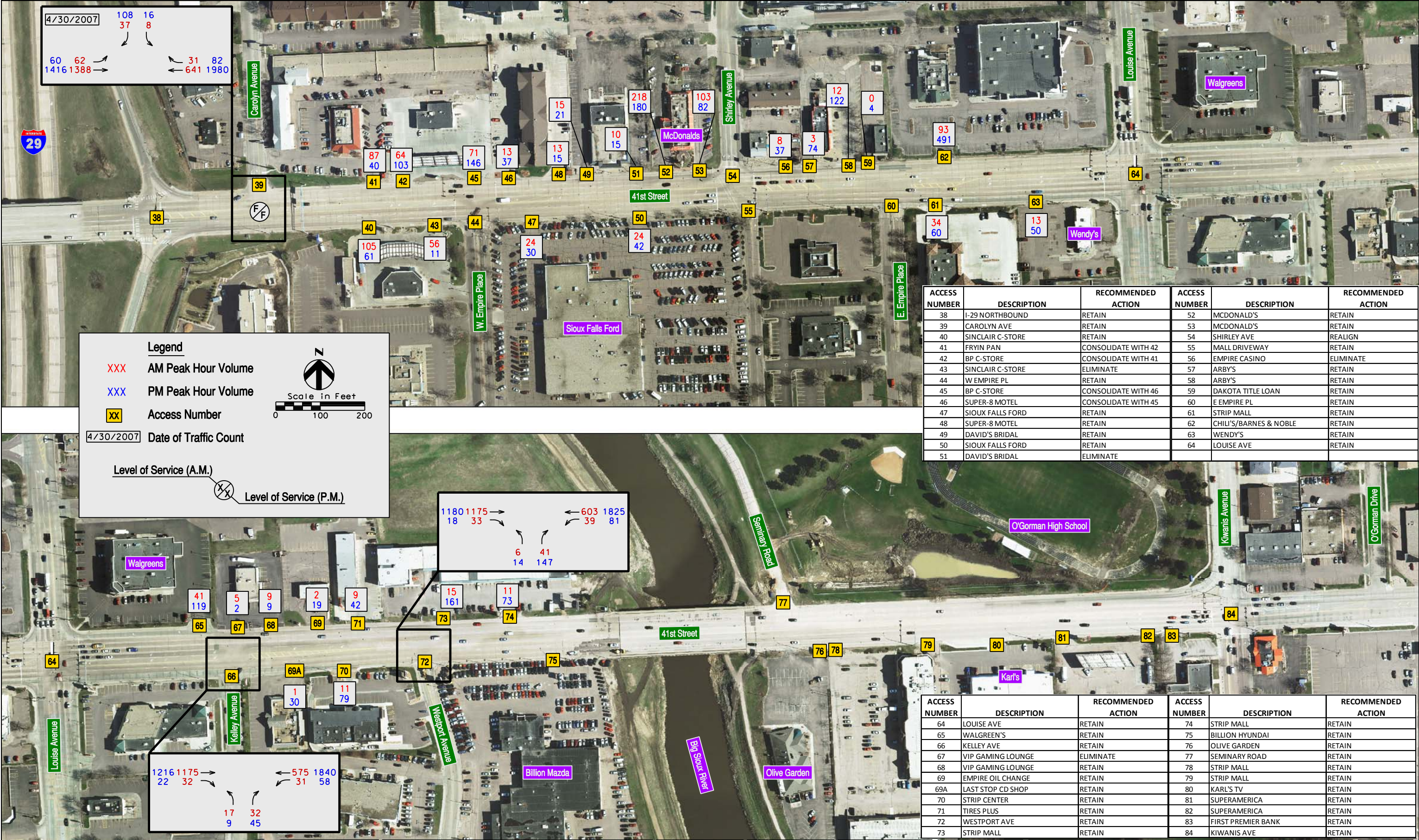
Year 2035 Traffic Volume Projections and Signalized Intersection LOS - No-Build Condition

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

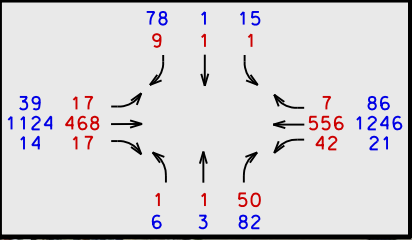
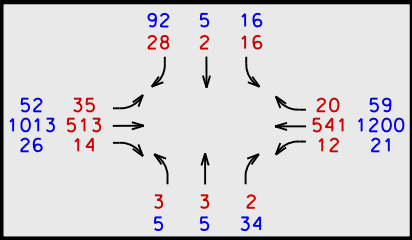
Figure 4-2c





ACCESS NUMBER	DESCRIPTION	RECOMMENDED ACTION	ACCESS NUMBER	DESCRIPTION	RECOMMENDED ACTION
38	I-29 NORTHBOUND	RETAIN	52	MCDONALD'S	RETAIN
39	CAROLYN AVE	RETAIN	53	MCDONALD'S	RETAIN
40	SINCLAIR C-STORE	RETAIN	54	SHIRLEY AVE	REALIGN
41	FRYIN PAN	CONSOLIDATE WITH 42	55	MALL DRIVEWAY	RETAIN
42	BP C-STORE	CONSOLIDATE WITH 41	56	EMPIRE CASINO	ELIMINATE
43	SINCLAIR C-STORE	ELIMINATE	57	ARBY'S	RETAIN
44	W EMPIRE PL	RETAIN	58	ARBY'S	RETAIN
45	BP C-STORE	CONSOLIDATE WITH 46	59	DAKOTA TITLE LOAN	RETAIN
46	SUPER-8 MOTEL	CONSOLIDATE WITH 45	60	E EMPIRE PL	RETAIN
47	SIOUX FALLS FORD	RETAIN	61	STRIP MALL	RETAIN
48	SUPER-8 MOTEL	RETAIN	62	CHILI'S/BARNES & NOBLE	RETAIN
49	DAVID'S BRIDAL	RETAIN	63	WENDY'S	RETAIN
50	SIOUX FALLS FORD	RETAIN	64	LOUISE AVE	RETAIN
51	DAVID'S BRIDAL	ELIMINATE			

ACCESS NUMBER	DESCRIPTION	RECOMMENDED ACTION	ACCESS NUMBER	DESCRIPTION	RECOMMENDED ACTION
64	LOUISE AVE	RETAIN	74	STRIP MALL	RETAIN
65	WALGREEN'S	RETAIN	75	BILLION HYUNDAI	RETAIN
66	KELLEY AVE	RETAIN	76	OLIVE GARDEN	RETAIN
67	VIP GAMING LOUNGE	ELIMINATE	77	SEMINARY ROAD	RETAIN
68	VIP GAMING LOUNGE	RETAIN	78	STRIP MALL	RETAIN
69	EMPIRE OIL CHANGE	RETAIN	79	STRIP MALL	RETAIN
69A	LAST STOP CD SHOP	RETAIN	80	KARL'S TV	RETAIN
70	STRIP CENTER	RETAIN	81	SUPERAMERICA	RETAIN
71	TIRES PLUS	RETAIN	82	SUPERAMERICA	RETAIN
72	WESTPORT AVE	RETAIN	83	FIRST PREMIER BANK	RETAIN
73	STRIP MALL	RETAIN	84	KIWANIS AVE	RETAIN



Legend

XXX AM Peak Hour Volume

XXX PM Peak Hour Volume

XX Access Number

Scale in Feet

0 100 200



ACCESS NUMBER	LOCATION	RECOMMENDED DISPOSITION	ACCESS NUMBER	LOCATION	RECOMMENDED DISPOSITION	ACCESS NUMBER	LOCATION	RECOMMENDED DISPOSITION
L1	34TH ST	RETAIN	L11	KINKOS/WALGREEN'S	RETAIN	L21	LIBERTY NATIONAL BANK	RETAIN
L2	STRIP MALL	RETAIN	L12	BARNES & NOBLE	RETAIN	L22	MALL DRIVEWAY	RETAIN
L3	SAM'S CLUB	RETAIN	L13	WENDY'S	ELIMINATE	L23	TARGET DRIVEWAY	RETAIN
L4	STRIP MALL	RETAIN	L14	STRIP MALL	RETAIN	L24	MALL DRIVEWAY	RETAIN
L5	APARTMENT COMPLEX	RETAIN	L15	TACO BELL	RETAIN	L25	EMPIRE PL	RETAIN
L6	WAL-MART	RETAIN	L16	RUDOLPH'S SHOES	RETAIN	L26	47TH ST	RETAIN
L7	APARTMENT COMPLEX	RETAIN	L17	TACO BELL	RETAIN	L27	HY-VEE	RETAIN
L8	APARTMENT COMPLEX	RETAIN	L18	ERBERT & GERBERT SANDWICHES	RETAIN	L28	APARTMENT COMPLEX	RETAIN
L9	WAL-MART	MOVE TO SOUTH PROPERTY LINE	L19	EMPIRE PL	RETAIN	L29	49TH ST	RETAIN
L10	KENTUCKY PL	RETAIN	L20	43RD ST	RETAIN			

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Driveways and Non-Signalized Intersections
Louise Avenue from 49th St. to 34th St.
I-29 Exit 77 (41st Street) Crossroad Corridor Study Sioux Falls, SD

Figure

4-4c

5.0 Interchange Options

The Decennial Interstate Corridor Study, conducted for SDDOT in 2010, determined that the 41st Street interchange on I-29 needed improvement and identified two potential new interchange configurations: 1) a single-point interchange and 2) a diverging-diamond interchange (DDI).

These two interchange configurations were analyzed in detail as part of this study. A partial cloverleaf configuration was also developed and analyzed to respond to public concerns. These interchange configurations are discussed below.

Partial Coverleaf Interchange (Figure 5-1)

A question received during the comment period following the first public meeting spurred consideration of a partial cloverleaf configuration for I-29/41st Street. An illustration of a partial cloverleaf configuration for I-29/41st Street is shown in Figure 5-1. While the partial cloverleaf configuration may improve the level of service for some turning movements at the interchange by allowing non-stop travel through the interchange, the layout pushes the interchange traffic signals closer to existing traffic signals and may result in queue interference between intersections. In addition, a weaving condition is introduced for eastbound traffic between the interchange loops. The footprint of this interchange would require the acquisition of a multi-screen movie theater, a lounge, and three motels, resulting in millions of dollars in additional right-of-way costs. Compared to the other interchange configurations, the property impacts of this option are extensive.

Single Point Interchange (Figure 5-2)

A single point interchange configuration, shown in Figure 5-2, was considered because of its traffic flow benefits in urban situations and growing familiarity with local drivers. Other single point interchanges have been built on I-29 at 12th Street, Madison Street, and Benson Road. The single point interchange is served by a single signalized intersection on the arterial roadway, increasing the distance between interchange signals and adjacent signals. The single point interchange can be built within the existing right-of-way, but would require construction of a new, much larger, bridge over I-29. Pedestrians can cross the I-29 ramps at designated cross walks and can cross I-29 on the bridge. However, the single point interchange does not accommodate crossings of 41st Street within the limits of the interchange. Pedestrians wanting to cross 41st Street must go to the nearest signalized intersection west or east of the ramp intersections. An animation of the year 2035 PM peak hour traffic flow through the single point interchange can be viewed by clicking this link: [Animations\Single Point Interchange Yr 2035 PM Peak.wmv](#)

Diverging Diamond Interchange (Figure 5-3)

The Diverging Diamond Interchange (DDI), shown in Figure 5-3, is a new concept in the United States. Only a handful of this type of interchange have been built, but many more are under design or are planned. The DDI configuration alters the conventional traffic paths through the interchange area, improving many interchange flow characteristics, particularly for left-turn movements. A DDI interchange can be built at 41st/I-29 using the existing bridge with a slight widening. No additional right-of-way would be required although retaining walls would reduce visibility of adjacent properties and would require temporary

easements to construct. The DDI configuration provides good accommodations for pedestrians with nearly all crossings protected by signals. In this particular location, crossing of I-29 is proposed between the eastbound and westbound lanes. This type of configuration for pedestrians has worked well at other DDI locations. An animation (looking toward the east) of the year 2035 PM peak hour traffic flow through the diverging diamond interchange can be viewed by clicking this link: [Animations\DDI at I-29 Yr 2035 PM Peak.wmv](#) Access at Carolyn Avenue was examined with this option. Appendix A contains memoranda discussing the various Carolyn Avenue access options with the DDI.

Concept Options Comparison

The three interchange concept options were compared based on their ability to handle future traffic demand, right-of-way impacts, relative cost, ease of construction, traffic impacts during construction, and public acceptability. Both the single point and diverging diamond interchanges are capable of providing acceptable levels of service based on operations and microsimulation analyses. The DDI configuration has considerably lower costs because of the ability to use the existing bridge over I-29. Likewise, the DDI configuration is easier to construct because of the ability to use the existing bridge and maintain 41st Street at approximately its existing vertical profile. Both configurations were well received by the public. An overall comparison of the three configurations is summarized in Table 3.

Table 3 – Interchange Concept Options Comparison

Interchange Type	Partial Cloverleaf	Single Point	Diverging Diamond
Year 2035 Traffic Operations (PM Peak hour) (1)			
Intersection LOS	(2)	D	C
Avg. Delay (seconds)	(2)	37	25 to 30 (3)
Right-of-Way Impacts	Major	Minimal	Minimal
Approximate Construction Cost (Million \$)	(2)	11	5
Ease of Construction	Simple	Complex	Moderate
Traffic impacts during construction	Minor	Major	Moderate
Expected Driver Acceptance	Good	Good	Moderate (4)
Pedestrian Accommodations	Moderate	Moderate	Good

Notes:

- (1) Existing: LOS=E or F, delay=67 to 86 sec.; Yr 2035 No-build: LOS=F, delay = 307 to 351 seconds
- (2) Due to the significant property impacts of the partial cloverleaf interchange, level of service and construction cost were not determined for the partial cloverleaf concept option
- (3) SB ramp intersection = 25 seconds, NB ramp intersection = 30 seconds (VISSIM[®] analysis)
- (4) Adequate driver education at other DDI installations has led to overall good driver acceptance.

Consultant Recommended Option

HDR recommends the Diverging Diamond Interchange configuration mainly because of its:

1. Good traffic operations
2. Low cost compared to the single point interchange
3. Minimal impact on traffic during construction compared to the single point interchange
4. Minimal right-of-way impacts compared to the partial cloverleaf configuration
5. Desirable and safe pedestrian provisions
6. Opportunities for aesthetic treatments

Interchange Aesthetic Concepts (Figures 5-4 to 5-6)

Because of its configuration, the DDI is not as adversely affected by sight line restrictions as other interchange types. This allows for incorporation of unique and appealing aesthetic and landscaping features at the I-29/41st Street DDI. Landscape architects from subconsultant Confluence have developed landscaping design concepts for the interchange. These concepts are considered generally acceptable from the perspective of sight lines and sight distances, especially since the right turn movements from the ramps onto 41st Street will be signal controlled. Landscaping and resulting sight line analysis are more of a preliminary and final design issue and the design concepts in this study are mainly for illustrative purposes. The landscaping design concepts are shown in Figures 5-4 to 5-6.



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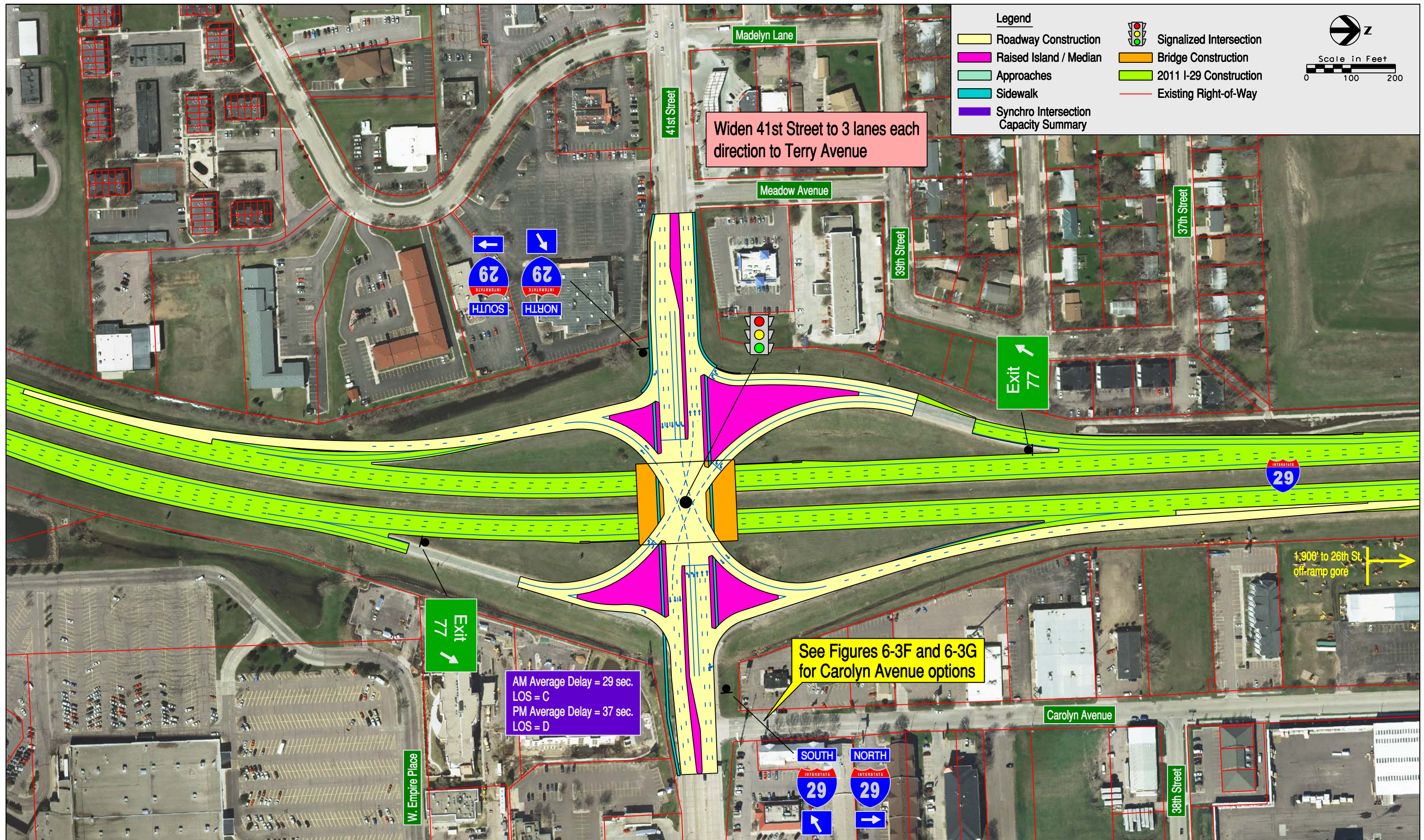


Partial Cloverleaf Interchange Option

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
5-1



Date of Aerial Photography: 2008

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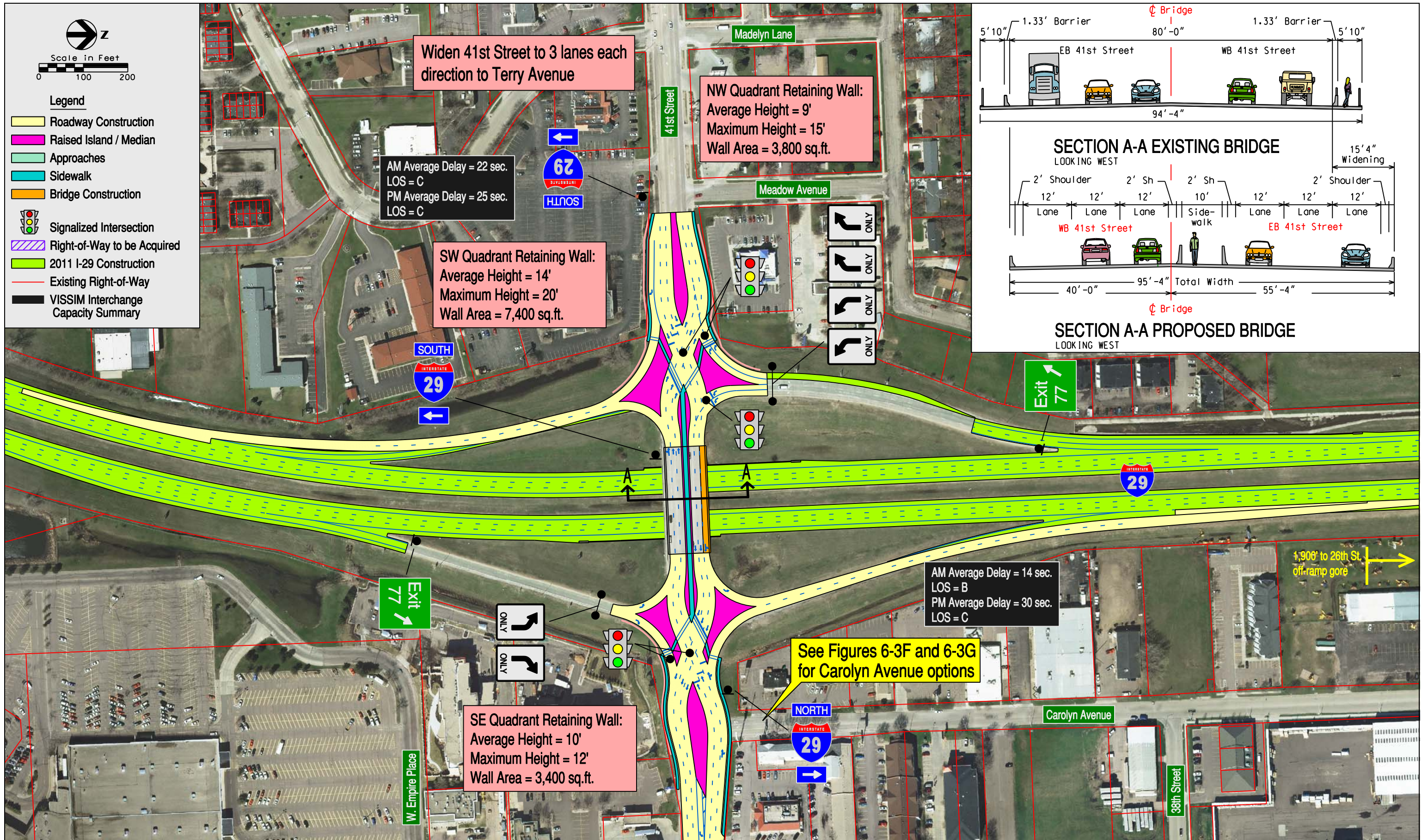


Single Point Interchange Option

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
5-2



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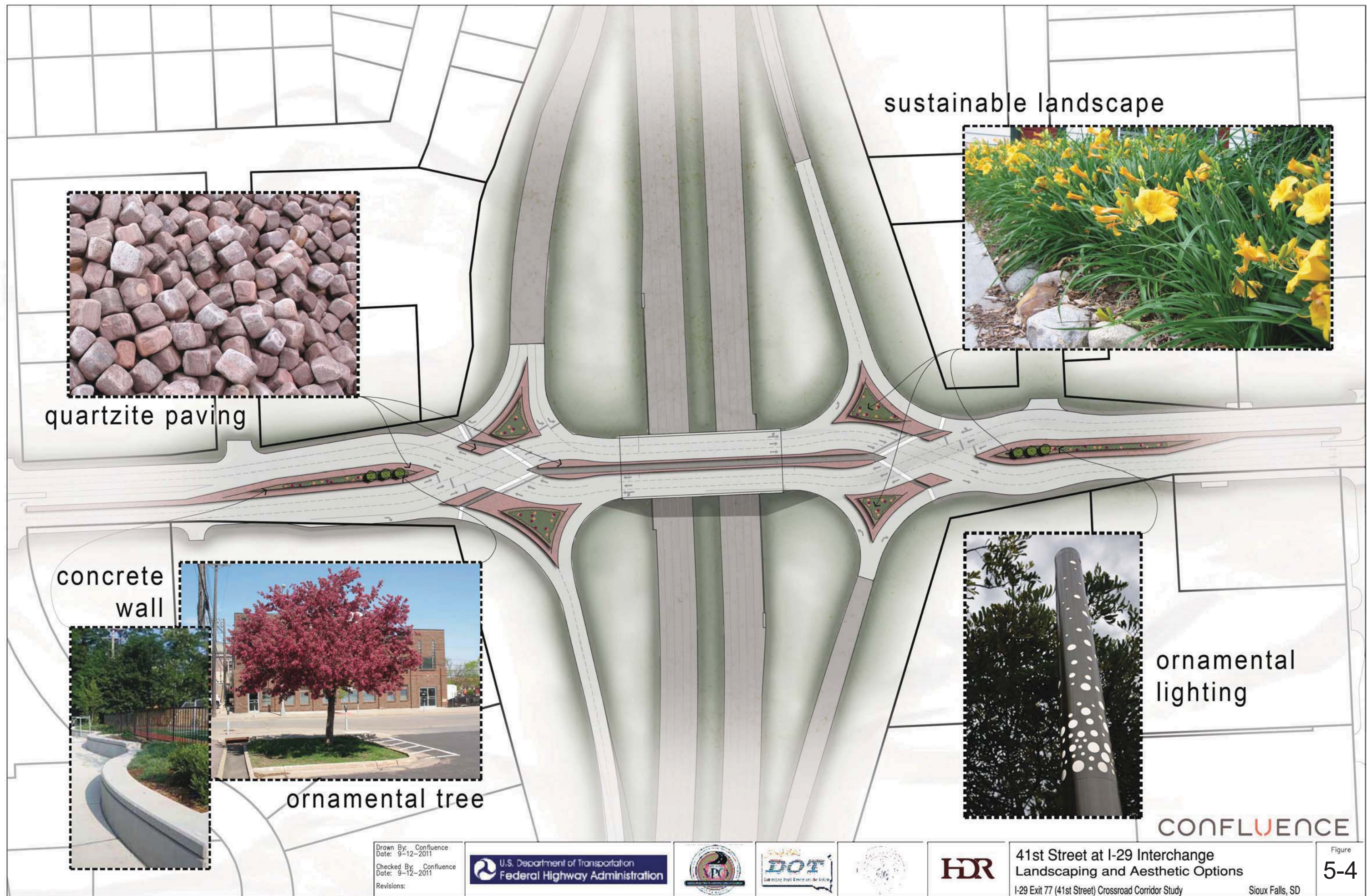


Diverging Diamond Interchange Option

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
5-3



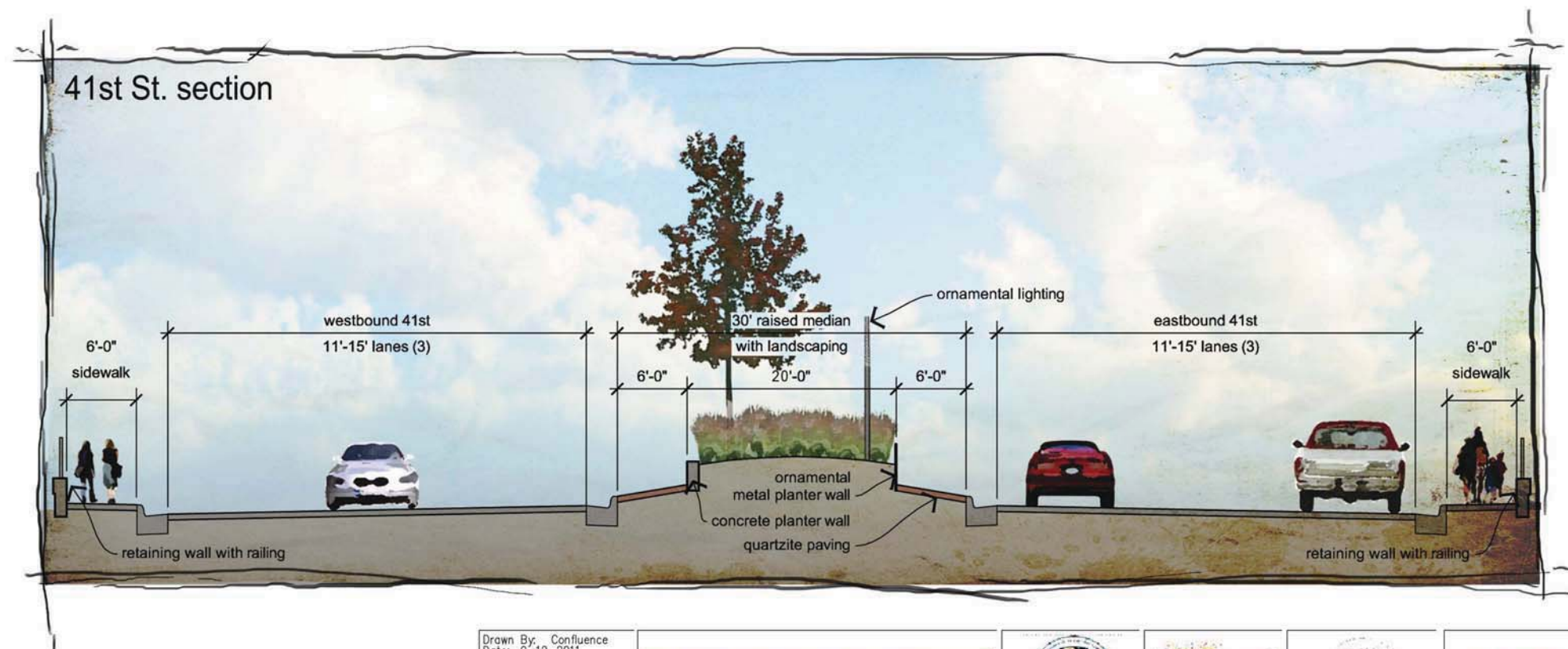
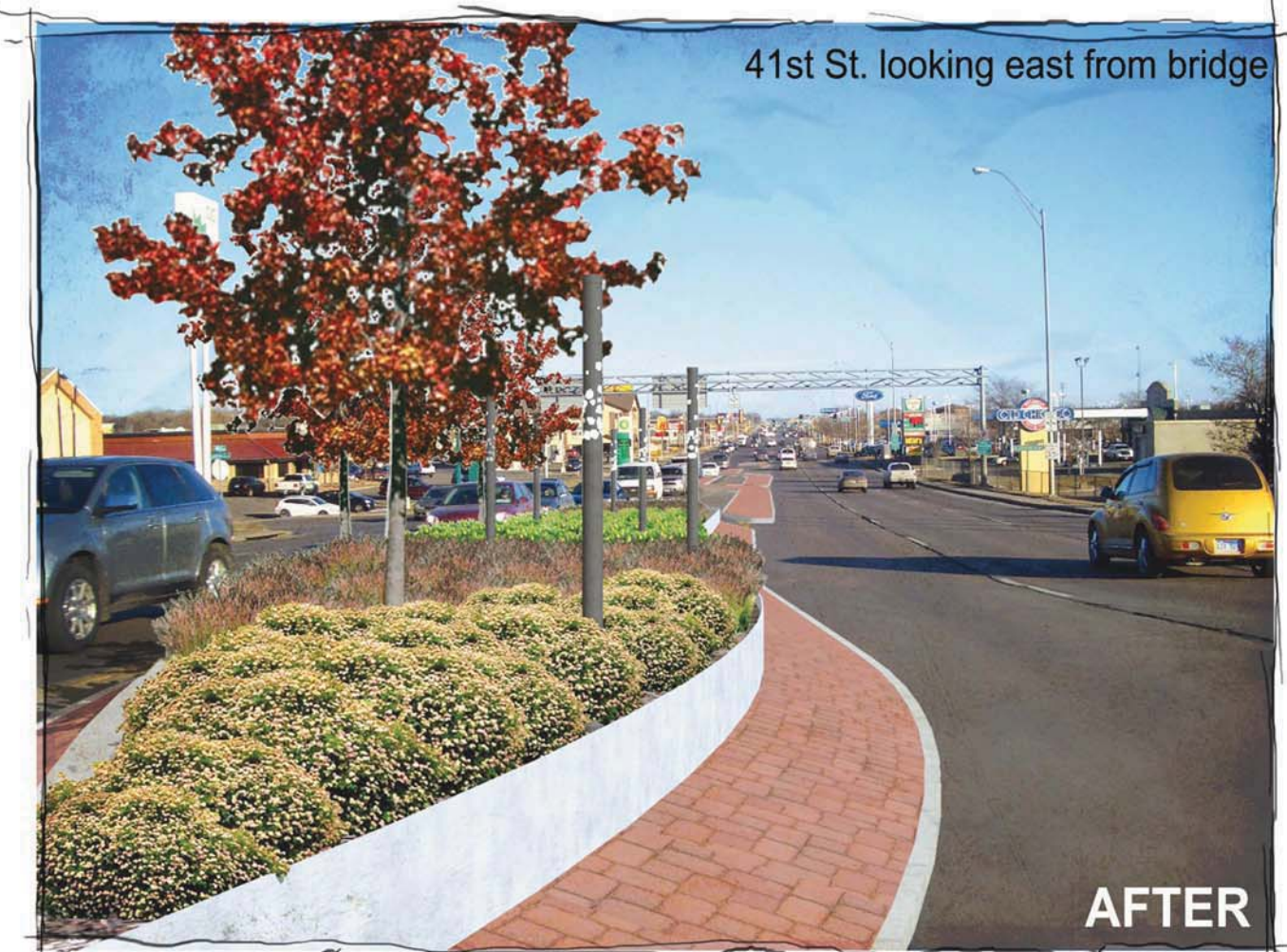
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41st Street at I-29 Interchange
 Landscaping and Aesthetic Options
 I-29 Exit 77 (41st Street) Crossroad Corridor Study
 Sioux Falls, SD

CONFLUENCE

Figure
 5-4



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41st Street at I-29 Interchange
Landscaping and Aesthetic Options
I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
5-5



BEFORE



BEFORE



AFTER

41st St. looking west towards bridge



41st St. looking west from bridge

AFTER

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41st Street at I-29 Interchange
Landscaping and Aesthetic Options
I-29 Exit 77 (41st Street) Crossroad Corridor Study
Sioux Falls, SD

Figure
5-6

6.0 Corridor Improvement Options

Existing Conditions

The 41st Street and Louise Avenue corridors within the study area currently experience periodic congestion that coincides with the normal peak period commuting patterns in Sioux Falls. In addition, these routes also experience periodic congestion that stems from demand for travel to and from the commercial destinations in southwest Sioux Falls, particularly the Empire Mall and other retail stores. This commerce-related traffic can cause afternoon and weekend congestion, especially during the busy holiday shopping period in November and December. Figure 4-2a shows the traffic counts at signalized intersections and the daily traffic volumes on the roadways within the study area. Figure 4-2b shows the existing balanced traffic volumes at signalized intersections used to determine intersection level of service.

Year 2035 No-Build Conditions

Forecasts of future traffic through the planning horizon in 2035 show continued traffic growth, particularly in the western portion of the 41st Street corridor near to developing residential neighborhoods. The remainders of the 41st Street and Louise Avenue corridors are already highly developed, although some increase in traffic volume can be expected due to general Sioux Falls growth. Future traffic volumes are shown in Figure 4-2c.

As stated in Section 4.0, corridor traffic volumes east of I-29 are expected to increase approximately 10 percent from existing to year 2035. Traffic volumes west of I-29 are expected to increase between 25 percent and 50 percent from existing to year 2035 conditions.

Concept Improvement Options

Roadway corridor needs throughout the study area vary, depending on the traffic volumes and the type and intensity of development fronting the roadways. Some common themes, however, can be seen:

- The need for access management – consolidation and elimination of some access points to improve travel safety and efficiency,
- The need to provide additional capacity at the signalized intersections, and
- The need to consider the use of medians to control unsafe movements.

Corridor improvement options were developed to address the anticipated transportation needs within the study area. Options such as reversible lanes, frontage roads, and corridor-length elevated structures were dismissed early on because of the associated access restrictions, right-of-way impacts, and construction costs, respectively. Traffic management measures such as self-optimizing traffic signals, real-time manual signal cycle adjustments from camera feedback, etc. are continually being reviewed by the City of Sioux Falls traffic engineering office.

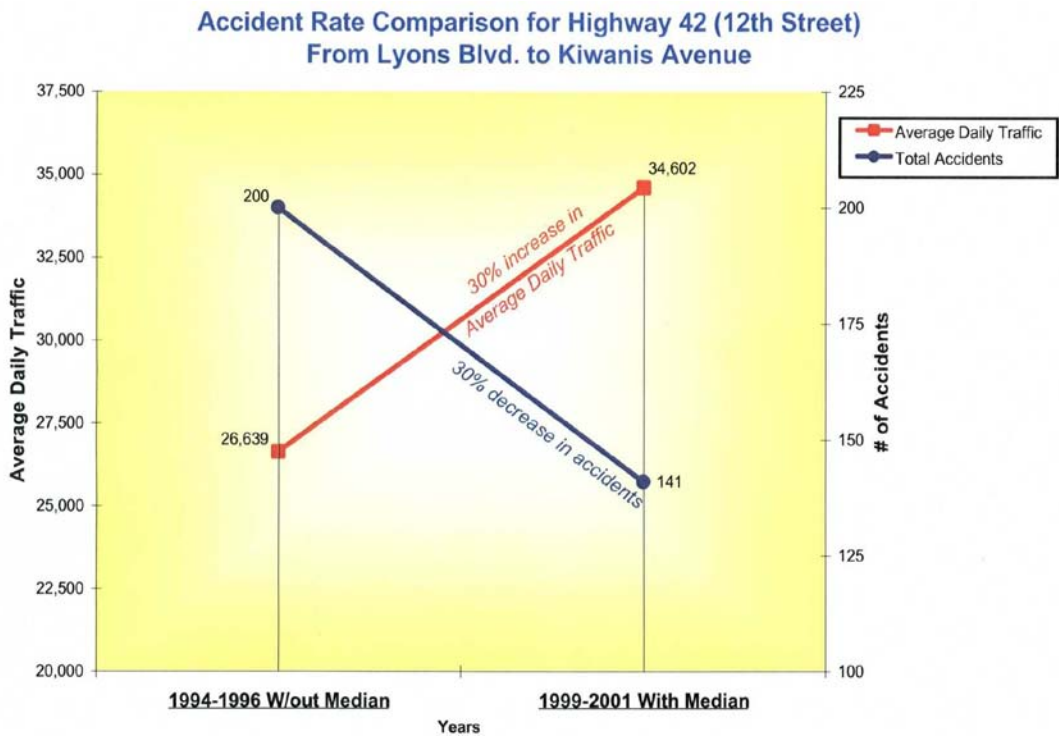
The goal of the improvement options developed for this corridor study represent reasonable improvements to the roadway system to provide the design goal level of service D or better throughout the corridor. Due to right-of-way constraints, some of the options developed could not provide level of service D but did provide some improvement in traffic conditions when compared to No-Build conditions. Factors that will determine implementation of the improvements include traffic conditions, roadway conditions, funding availability, public input, and political priorities.

Many of the improvement options entail acquisition of additional roadway right-of-way, which may be secured by landowner donation, direct purchase, or eminent domain proceedings. The ability to acquire right-of-way may be a factor in implementation of an option.

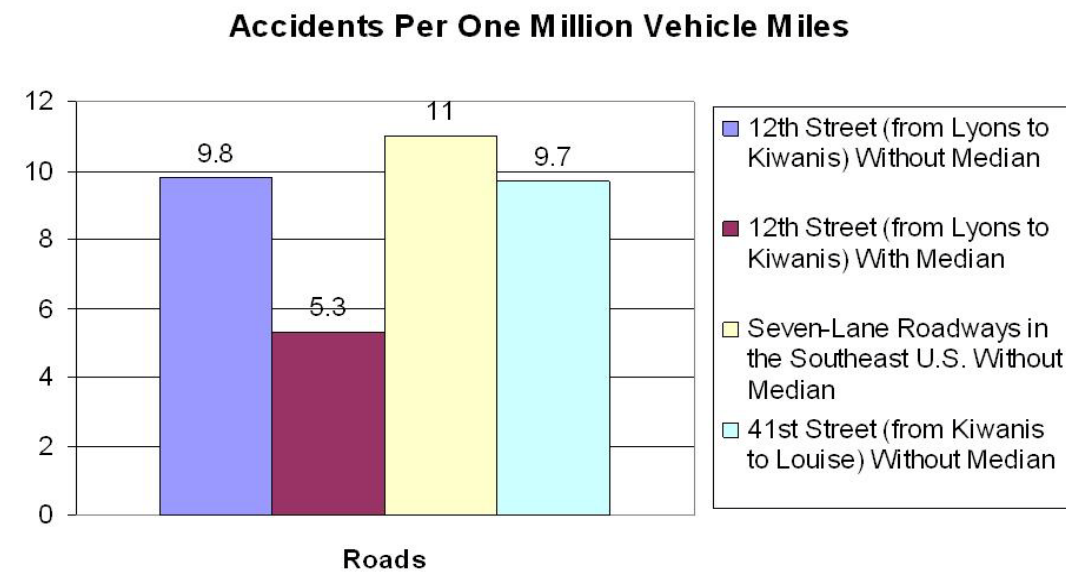
Raised Median Considerations

Several of the corridor improvement options include incorporation of a raised center median. Business/landowners predominantly opposed any form of center raised median because of the perceived reduction in access to adjacent properties due to restrictions in left turn movements. In reality, left turns into and out of properties are difficult under existing conditions because of the high through traffic volumes on 41st Street.

Safety is one of the main benefits of a raised center median. National studies have consistently shown that crash rates are 20% to 30% higher for 6 lane roadways without a raised median in comparison to those with a raised median. Studies on a similar roadway in Sioux Falls, West 12th Street, indicated that traffic volumes increased 30% while crashes decreased 30% when the roadway was reconstructed from a 5 lane roadway with a center two-way left turn lane to a 6 lane roadway with a raised center median as indicated in the following graphs.



This above graph illustrates the safety benefits of the raised median installation on West 12th Street. Traffic volumes increased 30% while the number of crashes decreased 30% from before to after installation of a raised center median.



The chart above provides an accident rate comparison of existing 41st Street with similar roadways. Again, crash rates are significantly reduced with a raised center median, especially as traffic volumes exceed 25,000 vehicles per day and 3 through lanes in each direction are warranted.

Chapter 8 of the City of Sioux Falls Engineering Design Standards states that “Medians should be constructed on arterial streets with four or six lanes of through travel. Medians should be constructed at arterial to arterial intersections to provide for more capacity, safety, and improve the operations of the roadway.”

SDDOT also has general standards related to the number of lanes needed to handle future traffic levels. These standards, contained in the SDDOT Road Design Manual, show that a six-lane cross-section with a median should be used for the expected level of traffic on 41st Street within the study area. The table below is reproduced below from the Road Design Manual for reference.

Number of Lanes	Traffic Volumes (1)	
	Rural Level	Urban
2	<8,000	<2,500
3	(2)	2,500 to 16,000
4	8,000 to 20,000 (3)	(3)
5	(2)	16,000 to 30,000
6	>20,000 (4)	>30,000 (4)

- (1) Construction/reconstruction projects are designed based on a typical 20-year ADT projection.
- (2) Continuous left turn lanes may be considered based on left turn volumes and/or when intersections and/or approaches are closely spaced together.
- (3) Undivided sections may be used if left turn movements are low and there is no accident history, otherwise consider installing a median or 5-lane section.
- (4) Medians should be used.

Regarding economic impacts to businesses resulting from a raised median, SDDOT and the SD Department of Revenue conducted an analysis of sales tax revenues from businesses along 12th Street from Marion Road to Lyons Boulevard. The analysis considered the years from 2004 to 2011. (The 12th Street raised median between Marion Road and I-29 was constructed in 2006.) This analysis showed that total sales tax revenues continued to increase on a yearly basis after construction of the 12th Street raised median, thereby demonstrating that the raised median did not have an overall detrimental economic impact on businesses. The analysis did account for inflation.

One additional benefit of a raised median is that the median provides a refuge for pedestrians as they cross a multi-lane street. This is especially a consideration on a roadway like 41st Street where up to 9 traffic lanes need to be crossed. Pedestrians who cannot make the crossing in a single signal cycle can wait on the raised median platform for the next signal cycle.

Segment-by-Segment Analysis

The 41st Street and Louise Avenue corridors were split into sections with reasonably uniform characteristics to facilitate development of alternatives. As illustrated in Figure 2-3, the sections included:

- **Segment 1** - 41st Street from Valley View Road to Marion Road
- **Segment 2** - 41st Street from Marion Road to I-29
- **Segment 3** - 41st Street from I-29 to Louise Avenue
- **Segment 4** - 41st Street from Louise Avenue to Kiwanis Avenue
- **Segment 5** - Louise Avenue from 34th Street to 41st Street
- **Segment 6** - Louise Avenue from 41st Street to 49th Street

Discussion of the concept options will be on a segment-by-segment basis.

Segment 1 – 41st Street from Valley View Road to Marion Road (Figures 6-1A to 6-1C)

Existing Conditions

As shown on Figure 4-1a, existing 41st Street is 2 lanes in each direction from Valley View Road to Marion Road with a center two-way left turn lane. There are no right turn lanes along 41st Street in this segment.

Between Valley View Road and Cambridge Avenue, the properties adjacent to 41st Street are residential or office lots. There are few properties that have direct access to 41st Street. Between Cambridge Avenue and Marion Road, the properties adjacent to 41st Street are mostly commercial with many access driveways to 41st Street.

The existing average daily traffic volume is slightly over 20,000 vehicles. Traffic generally flows smoothly throughout the day except in the vicinity of Marion Road where a combination of multiple closely spaced driveways and high traffic volumes at the intersection cause backups on 41st Street and long delays for drivers attempting to get onto 41st Street from the adjacent properties. Feedback at the landowner group meetings was that making left turns onto 41st Street is very difficult during peak traffic periods.

The existing sidewalks along 41st Street and Marion Road are separated from the roadways by a grassed boulevard.

Year 2035 No-Build Conditions

Continued development on the west side of Sioux Falls is anticipated. Much of the traffic going to and from the new development will travel I-29 to 41st Street. Therefore, the City of Sioux Falls Travel Demand Forecast Model predicts significant growth in traffic volumes on 41st Street west of I-29 by year 2035. Within the segment from Valley View Road to Marion Road, the projected year 2035 average daily traffic volume is just over 30,000 vehicles (50 percent increase over existing volumes). The existing 2 lanes in each direction on 41st Street will not accommodate that volume of traffic. The main bottleneck will be at the 41st Street/Marion Road intersection with a PM peak hour Level of Service F and average delay of 319 seconds (over 5 minutes) per vehicle.

Concept Improvement Options

The main improvements necessary on this section of 41st Street to achieve the design goal Level of Service D (or better) include:

- 3 through lanes in each direction on 41st Street
- 2 through lanes in each direction on Marion Road
- Dual left turn lanes for all approaches at the 41st Street/Marion Road intersection
- Right turn lanes at all approaches at the 41st Street/Marion Road intersection. Free right turn lanes with raised islands and separate receiving lanes would further improve intersection operations; however right-of-way impacts may preclude this. The VISSIM microsimulation modeling indicated that dual right turn lanes for the northbound to eastbound movement would be beneficial. Any of the concept improvement options would result in acquisition of the property at the southeast corner of 41st Street/Marion Road.
- A connection roadway from the Westbrooke Apartments to 39th Street
- Sidewalk at back of curb without a grassed boulevard

Three specific concept improvement options for this segment of 41st Street have been developed and are discussed below and illustrated in Figures 6-1A to 6-1C.

Option 1A – Raised Median on 41st Street and Marion Road (Figure 6-1A)

This option features a raised median on 41st Street from Valley View Road to Marion Road. Since there are no signalized intersections along 41st Street in this segment, no median breaks are proposed. U-turns would be allowed at Valley View Road and at Marion Road. A raised median is also proposed along Marion Road within the limits of the left turn lanes.

Benefits of this option include:

1. Restriction of left turn movements would improve safety and keep 41st Street traffic flowing smoothly.
2. The 41st Street/Marion Road intersection would operate well, especially with left turns restricted within the limits of the Marion Road left turn lanes.
3. Necessary widening is shown on the south side of existing 41st Street because of the residences on the north side of 41st Street, therefore, impacts to the north side residential properties should be minimal.

4. The raised medians on 41st Street and Marion Road would provide a pedestrian refuge at all signalized intersection crossings.

Drawbacks of this option include:

1. Access to commercial properties in the vicinity of the 41st Street/Marion Road intersection would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access.
2. Near Valley View Road, the south side service road would need to be narrowed to accommodate the 41st Street widening.
3. With the additional lanes and raised median, the 41st Street lanes would be closer to the south side residences than the existing lanes are.
4. At Marion Road, right-of-way would need to be acquired from the south side properties with a resulting reduction in parking spaces at the Burger King restaurant. Acquisition of the property in the southeast corner of the property would be necessary.

Option 1B – Raised Median on 41st Street with ¾ Access Movement Configuration (Figure 6-1B)

This option features a raised median on 41st Street from Valley View Road to Marion Road. At the Lewis Drug entrance, the raised median would be configured to allow for left turns into the north and south side properties but would not allow left turns out of those properties. This type of median configuration is becoming more common on 4 and 6 lane urban arterials because of the elimination of the left turn movement across 4 or 6 lanes of traffic. It is commonly referred to as a “¾ movement configuration”. U-turns would be allowed at the ¾ movement configuration. With this option, there would be no raised median on Marion Road.

Benefits of this option include:

1. Restriction of left turn movements would improve safety and keep 41st Street traffic flowing smoothly.
2. The ¾ movement configuration would provide for left turns off of 41st Street at the Lewis Drug and south side commercial entrances, which is a key access location for the north and south side properties. Allowing u-turns at the ¾ movement configuration would provide reasonable access to most of the commercial properties along 41st Street.
3. Necessary widening is shown on the south side of existing 41st Street because of the residences on the north side of 41st Street, therefore, impacts to the north side residential properties should be minimal.
4. Access to properties along Marion Road would not be restricted by a raised median. However, vehicles in the through and left turn lanes would effectively limit left turns into and out of businesses during peak traffic periods.
5. The 41st Street raised median would provide a pedestrian refuge at the signalized crossings at Valley View Road and at Marion Road.

- Drawbacks of this option include:
- 1. Drivers wanting to get from eastbound 41st Street to Wells Fargo bank would have to take a left turn at the ¾ movement configuration and then go through the Lewis Drug parking lot. This is essentially how many drivers now get to Wells Fargo Bank.
 - 2. Near Valley View Road, the south side service road would need to be narrowed to accommodate the 41st Street widening.
 - 3. With the additional lanes and raised median, the 41st Street lanes would be closer to the south side residences than the existing lanes are.
 - 4. At Marion Road, right-of-way would need to be acquired from the south side properties with a resulting reduction in parking spaces at the Burger King restaurant. Acquisition of the property in the southeast corner of the property would be necessary.

Option 1C – Center Two-Way Left Turn Lane (Figure 6-1C)

This option provides a center two-way left turn lane on 41st Street in lieu of a center raised median.

- Benefits of this option include:
- 1. There would be no physical barrier to prohibit left turning traffic onto and off of 41st Street.
 - 2. Right-of-way impacts would be minimized compared to options 1A and 1B.
 - 3. Most business/landowners preferred this option.
- Drawbacks of this option include:
- 1. Vehicle safety is compromised by allowing left turn movements all along 41st Street.
 - 2. Without a center raised median, pedestrian crossings will be quite long for all approaches at the Marion Road intersection.
 - 3. Acquisition of the property in the southeast corner of the property would be necessary.

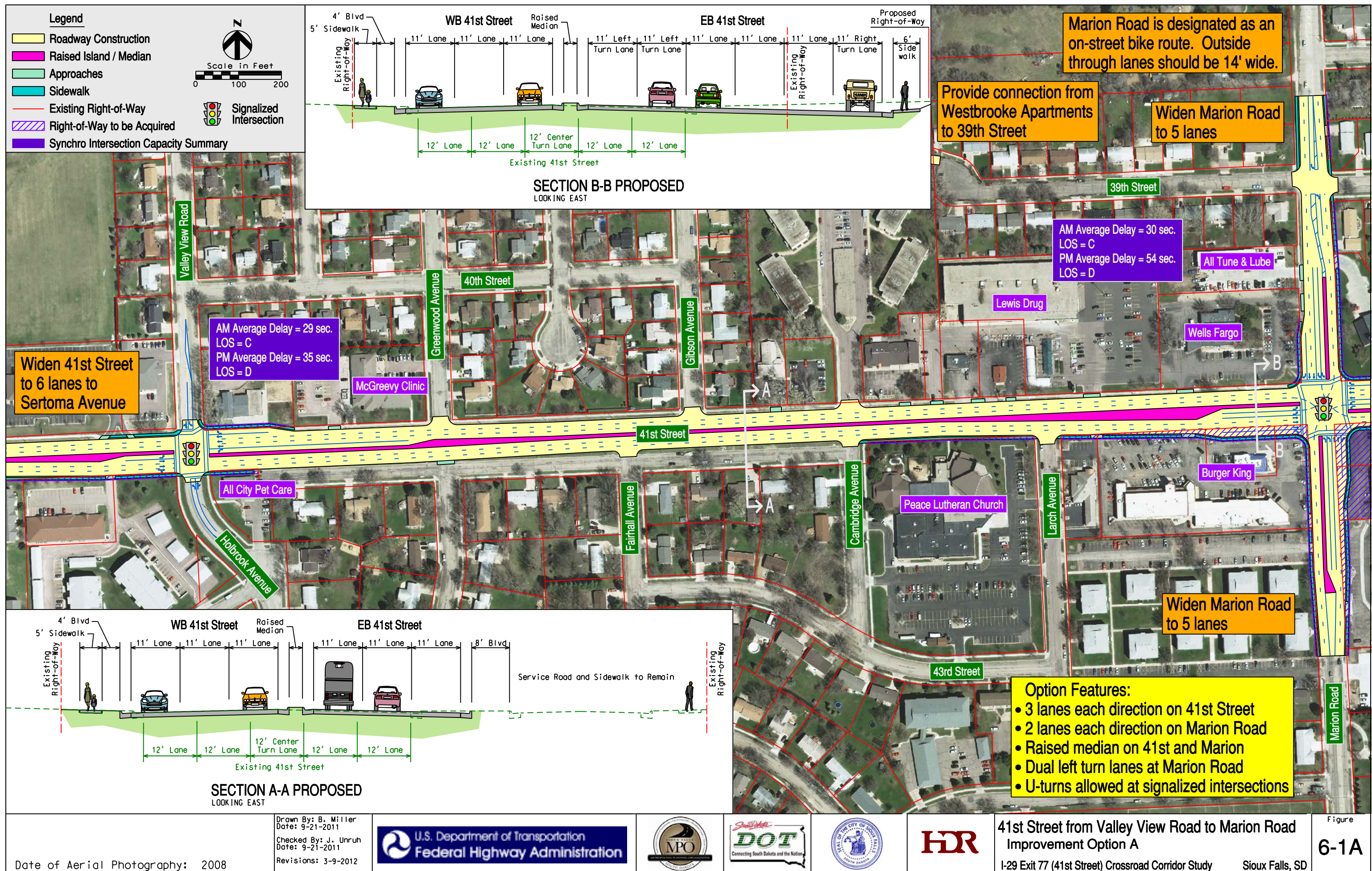
Consultant Recommended Option

HDR recommends Option 1B. While the raised center median restricts left turns on 41st Street, the ¾ movement configuration allows left turns into properties at a key location while at the same time providing the safety benefits of restricting the left-out movement. Relocation of the Lewis Drug main driveway to align with Larch Avenue and incorporation of a back access roadway from Larch Avenue to Marion Road would address many of the access concerns raised by business/landowners.

Table 4 – Segment 1 Concept Options Comparison

Option	A – Raised median	B – Raised median w/ ¾ movement	C – Center two-way left turn lane
Year 2035 Traffic Operations (PM Peak hour)			
Valley View Road intersection			
LOS	D	D	D
Avg. Delay (seconds)	35	35	35
Marion Road intersection (1)			
LOS	D	D	D
Avg. Delay (seconds)	54	54	54
Roadway Safety	Good	Good	Poor
Right-of-Way Impacts	Moderate (0.65 ac)	Moderate (0.73 ac)	Minimal (0.39 ac)
Construction Cost (million \$)	Moderate (4.2)	Moderate (4.2)	Moderate (4.0)
Ease of Construction	Moderate	Moderate	Moderate
Traffic Impacts during Construction	Moderate	Moderate	Moderate
Business/landowner Acceptance	Poor	Moderate	Good
Driver Acceptance	Moderate	Good	Good
Meets design guidelines	Yes	Yes	No
Pedestrian benefits	Good	Good	Moderate

Notes:
(1) Existing: LOS=D, delay=53 sec.; Yr 2035 No-build: LOS=F, delay = 319 seconds



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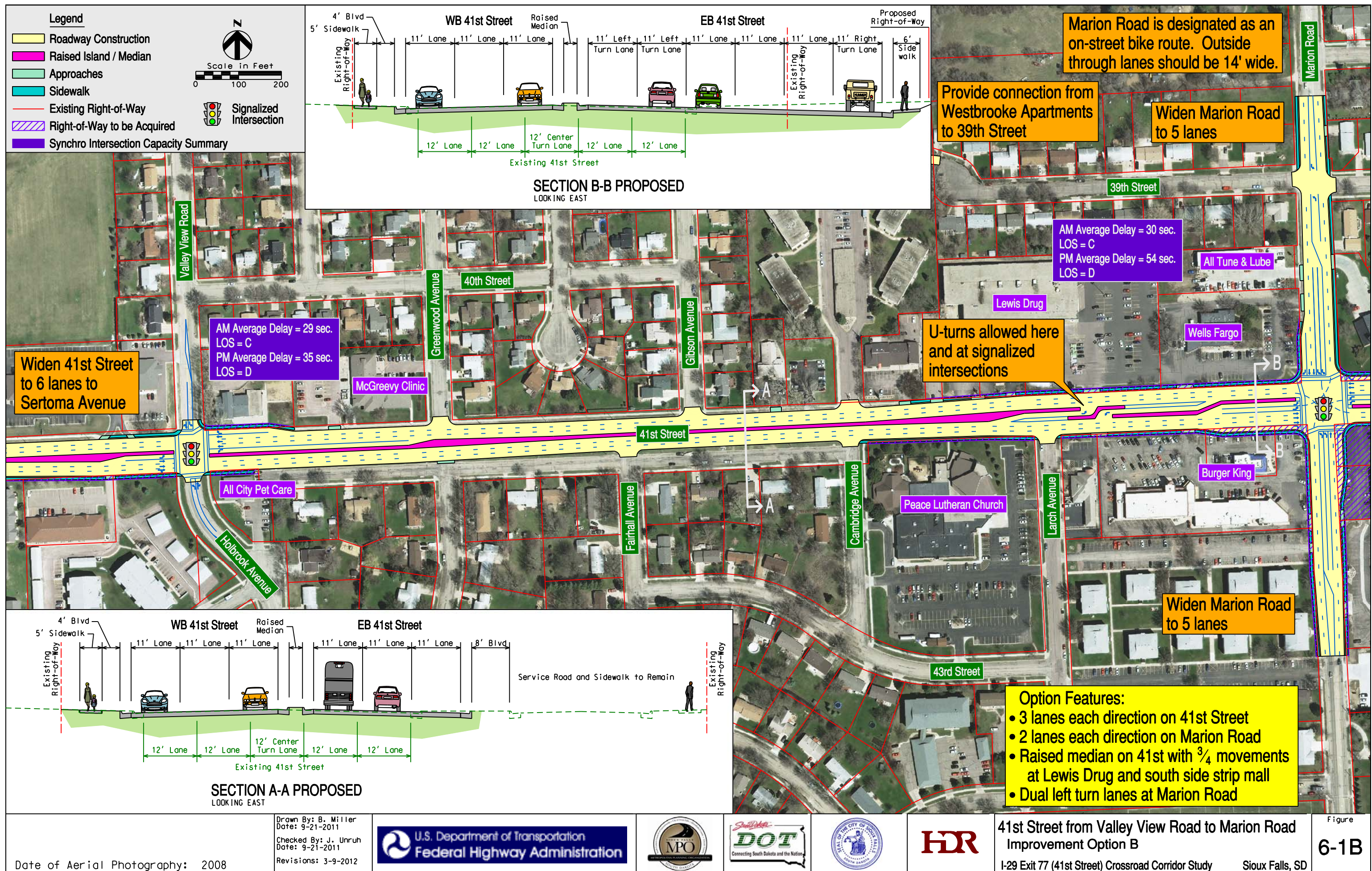


41st Street from Valley View Road to Marion Road
Improvement Option A

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
6-1A



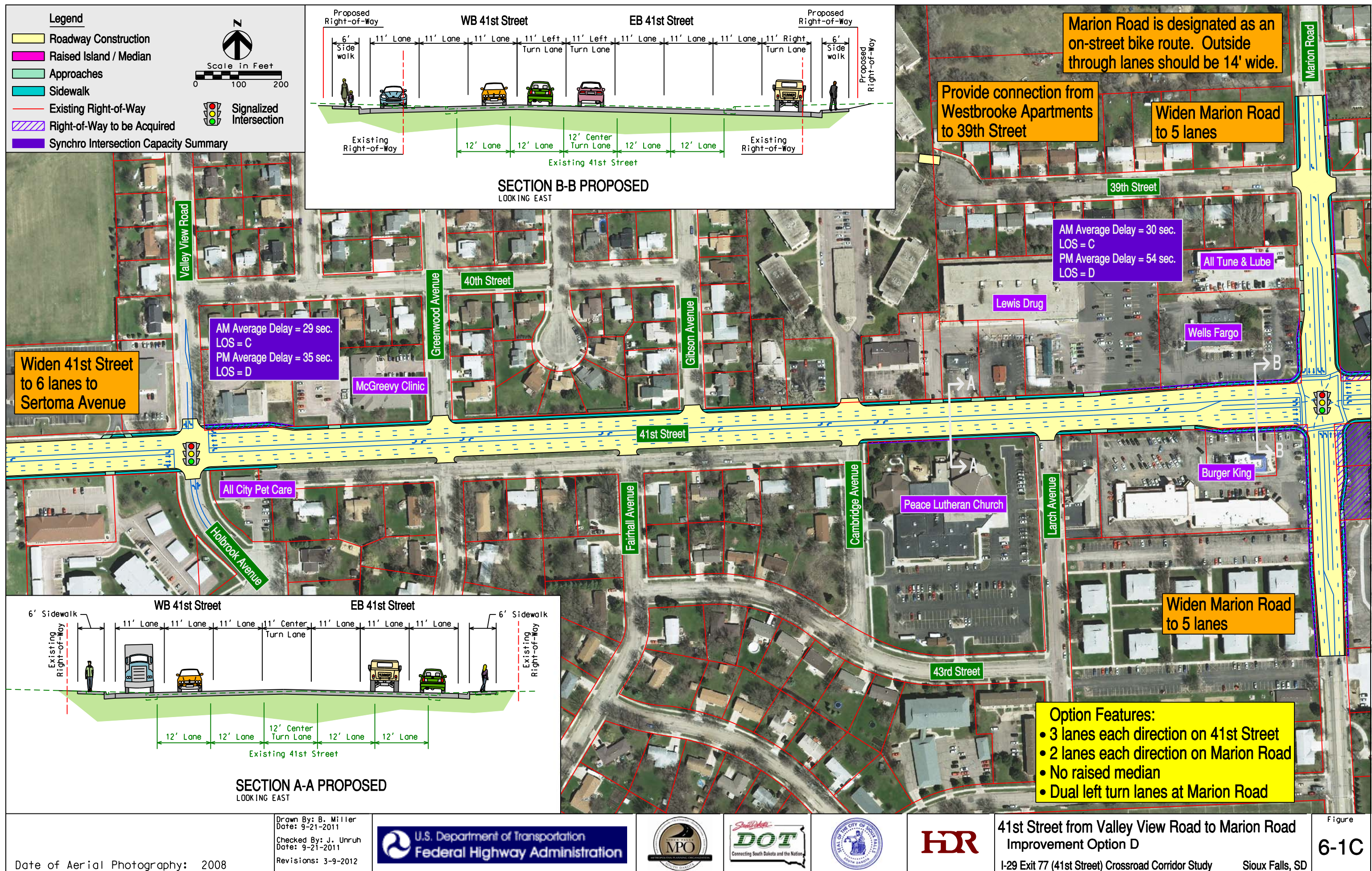
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Revisions: 3-9-2012



41st Street from Valley View Road to Marion Road
Improvement Option B
I-29 Exit 77 (41st Street) Crossroad Corridor Study
Sioux Falls, SD

Figure
6-1B



Segment 2 – 41st Street from Marion Road to I-29 (Figures 6-2A to 6-2C)

Existing Conditions

As shown on Figure 4-1a, existing 41st Street is 2 lanes in each direction from Marion Road to I-29 with a center two-way left turn lane. There are no right turn lanes along 41st Street in this segment except for the westbound to northbound movement at the Marion Road intersection.

On the north side of 41st Street, the land use transitions from single-family homes between Marion Road and Terry Avenue to apartments from Terry Avenue to Madelyn Lane to commercial businesses (Gas Stop convenience store and IHOP restaurant) from Madelyn Lane to I-29. Access to the homes and apartments is from 40th Street. The Gas Stop has 2 accesses from 41st Street, 1 access from Madelyn Lane and one access from Meadow Avenue. IHOP has one access to Meadow Avenue.

The south side of 41st Street is lined with a variety of commercial businesses and office buildings. Most of the properties have direct access to 41st Street.

The existing average daily traffic volume is slightly under 26,000 vehicles. Traffic generally flows smoothly during non-peak periods. During the morning rush hour, the eastbound lanes are often backed up because of the delay at the I-29 northbound on-ramp. In the afternoon rush hour, westbound traffic generally experiences long delays at the Marion Road intersection. The access driveways generally do not cause significant traffic problems on 41st Street. Feedback at the landowner group meetings was that making left turns onto 41st Street is very difficult during peak traffic periods. The managers of the IHOP restaurant and Baymont Inn stated that they generally send customers to 39th Street and the traffic signal at Terry Avenue to get to the eastbound 41st Street lanes. In effect, making left hand turns onto 41st Street is very difficult during peak traffic periods.

The existing sidewalks along 41st Street and Marion Road are separated from the roadways by a grassed boulevard. South Dakota Achieve has several housing facilities within three blocks of 41st Street. Residents with walkers and motorized wheel chairs have difficulty crossing 41st Street because of the lack of ADA compliant ramps at intersections, especially Terry Avenue and Marion Road.

Year 2035 No-Build Conditions

With a projected year 2035 average daily traffic volume of between 36,000 and 38,000 vehicles, the existing 2 lanes in each direction on 41st Street will not be sufficient. The main bottleneck will be at the 41st Street/Marion Road intersection with a PM peak hour Level of Service F and average delay of 319 seconds (5 minutes 19 seconds) per vehicle. This compares to an existing Level of Service D and average delay of 53 seconds per vehicle.

Concept Improvement Options

The main improvements necessary on this section of 41st Street to achieve the design goal Level of Service D (or better) include:

- 3 through lanes in each direction on 41st Street
- 2 through lanes in each direction on Marion Road
- Dual left turn lanes at all approaches at the 41st Street/Marion Road intersection

- Separated right turn lanes at all approaches at the 41st Street/Marion Road intersection
- Dual right turn lanes at the 41st Street/Marion Road intersection for the northbound to eastbound movement. Any of the concept improvement options would result in acquisition of the property at the southeast corner of 41st Street/Marion Road.
- Sidewalk at back of curb without a grassed boulevard

Three specific concept improvement options for this segment of 41st Street have been developed and are discussed below and illustrated in Figures 6-2A to 6-2C. All of the concept options incorporate the DDI at I-29. Two animations of the 41st Street/Marion Road intersection operation with year 2035 traffic volumes can be viewed. The first animation (looking east along 41st Street) shows mostly Marion Road traffic: [Animations\41st and Marion Yr 2035 PM Peak Marion traffic.wmv](#) The second animation (looking east along 41st Street) shows mostly 41st Street traffic: [Animations\41st and Marion Yr 2035 PM Peak 41st traffic.wmv](#) Both animations also show traffic on 41st Street from Marion Road to I-29

Option 2A – Raised Median on 41st Street and Marion Road (Figure 6-2A)

This option features a raised median on 41st Street from Marion Road to I-29. The signalized intersection at Terry Avenue would be maintained. U-turns would be allowed at Marion Road and at Terry Avenue. U-turns would not be allowed at I-29. A raised median is also proposed along Marion Road within the limits of the left turn lanes.

Benefits of this option include:

1. Restriction of left turn movements would improve safety and keep 41st Street traffic flowing smoothly.
2. The 41st Street/Marion Road intersection would operate well, especially with left turns restricted within the limits of the Marion Road left turn lanes.
3. Necessary widening is shown on the south side of existing 41st Street because of the residences on the north side of 41st Street, therefore, impacts to the north side residential properties should be minimal.
4. The raised medians on 41st Street and Marion Road would provide a pedestrian refuge at all signalized intersection crossings.

Drawbacks of this option include:

1. Access to commercial properties along 41st Street and Marion Road in the vicinity of the 41st Street intersection would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access. The business owners did not consider the existing parallel streets such as 39th Street and 42nd Street as adequate back access.
2. With the additional lanes and raised median, the 41st Street lanes would be closer to the south side businesses than the existing lanes are. Additional right-of-way would need to be acquired from south side properties.
3. At Marion Road, the property in the southeast corner of the intersection would be a total acquisition.

Option 2B – Raised Median on 41st Street with ¾ Movement Configuration (Figure 6-2B)

This option features a raised median on 41st Street from Marion Road to I-29. At Madelyn Lane/Gateway Boulevard, the raised median would be configured to allow for left turns to the north and south legs of the intersection but would not allow left turns from those legs of the intersection. This type of median configuration is becoming more common on 4 and 6 lane urban arterials because of the elimination of the left turn movement across 4 or 6 lanes of traffic. It is commonly referred to as a “¾ movement configuration”. U-turns would be allowed at the ¾ movement configuration. With this option, there would be no raised median on Marion Road.

Benefits of this option include:

- 1. Restriction of left turn movements would improve safety and keep 41st Street traffic flowing smoothly.
- 2. The ¾ movement configuration would provide for left turns off of 41st Street at the Madelyn Lane/Gateway Boulevard intersection. This is a key access location for the north and south side properties. Allowing u-turns at the ¾ movement configuration would provide reasonable access to most of the commercial properties along 41st Street.
- 3. Access to properties along Marion Road would not be restricted by a raised median. However, vehicles in the through and left turn lanes would effectively limit left turns into and out of businesses during peak traffic periods.

Drawbacks of this option include:

- 1. With the additional lanes and raised median, the 41st Street lanes would be closer to the south side businesses than the existing lanes are. Additional right-of-way would need to be acquired from south side properties.
- 2. At Marion Road, the property in the southeast corner of the intersection would be a total acquisition.

Option 2C – Center Two-Way Left Turn Lane (Figure 6-2C)

This option provides a center two-way left turn lane on 41st Street in lieu of a center raised median. A section of raised median is required at the DDI interchange to provide for proper traffic lane delineation.

Benefits of this option include:

- 1. There would be no physical barrier to prohibit left turning traffic onto and off of 41st Street west of the DDI southbound off ramp intersection.
- 2. Right-of-way impacts would be minimized compared to options 2A and 2B.
- 3. Most business/landowners preferred this option.

Drawbacks of this option include:

- 1. Vehicle safety is compromised by allowing left turn movements all along 41st Street.
- 2. At Marion Road, the property in the southeast corner of the intersection would be a total acquisition.

Option 2C is also considered technically feasible. This option minimizes right-of-way impacts but does not provide the safety benefits of a raised center median. Access to properties is maximized with this option.

Table 5 – Segment 2 Concept Options Comparison

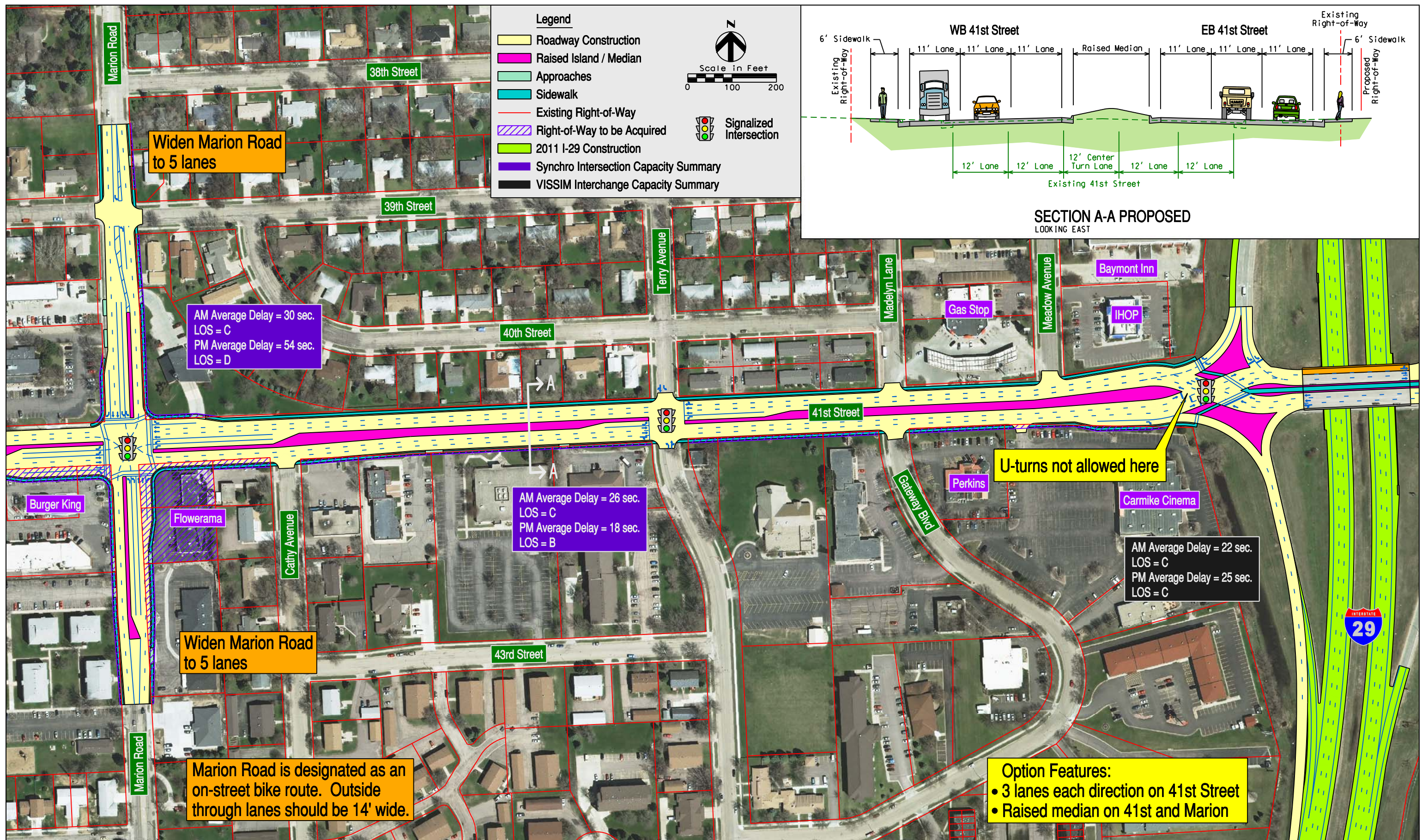
Option	A – Raised median	B – Raised median w/ ¾ movement	C – Center two-way left turn lane
Year 2035 Traffic Operations (PM Peak hour)			
Marion Road intersection (1)			
LOS	D	D	D
Avg. Delay (seconds)	54	54	54
Terry Avenue intersection			
LOS	B	B	B
Avg. Delay (seconds)	18	18	18
I-29 SB off-ramp intersection (2)			
LOS	C	C	C
Avg. Delay (seconds)	25	25	25
Roadway Safety	Good	Good	Poor
Right-of-Way Impacts	Moderate (1.55 ac)	Moderate (1.60 ac)	Minimal (1.17 ac)
Construction Cost (million \$)	Moderate (4.6)	Moderate (4.4)	Moderate (4.2)
Ease of Construction	Moderate	Moderate	Moderate
Traffic Impacts during Construction	Moderate	Moderate	Moderate
Business/landowner Acceptance	Poor	Moderate	Good
Driver Acceptance	Moderate	Good	Good
Meets design guidelines	Yes	Yes	No
Pedestrian benefits	Good	Good	Moderate

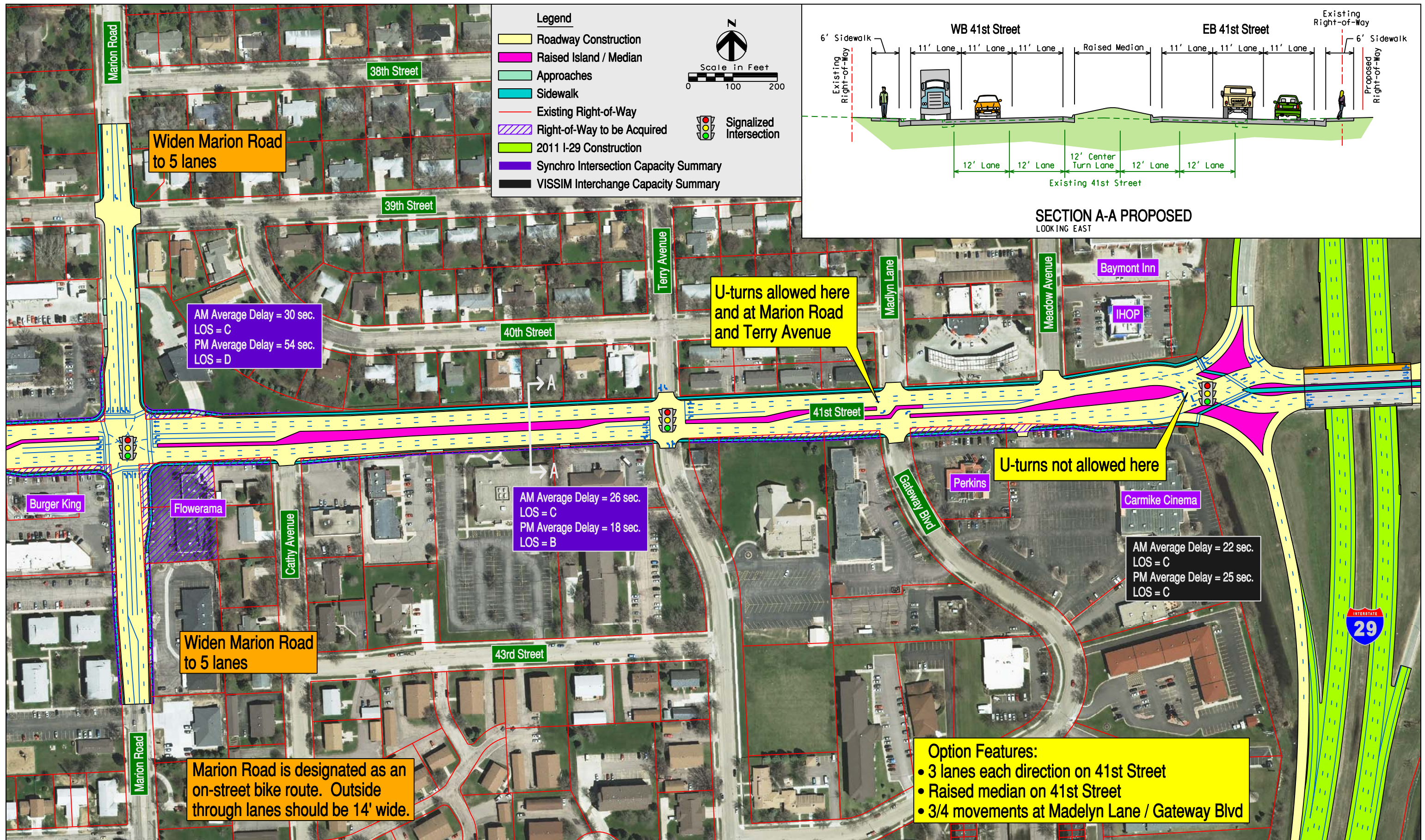
Notes:

- (1) Existing: LOS=D, delay=53 sec.; Yr 2035 No-build: LOS=F, delay = 319 seconds
- (2) Existing: LOS=F, delay=86 sec.; Yr 2035 No-build: LOS=F, delay = 351 seconds

Consultant Recommended Option

HDR recommends Option 2B. While the raised center median restricts left turns on 41st Street, the ¾ movement configuration allows left turns off of 41st Street at a key location while at the same time providing the safety benefits of restricting the left-out movement.





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Drawn By: B. Miller
Date: 9-21-2011
Checked By: J. Unruh
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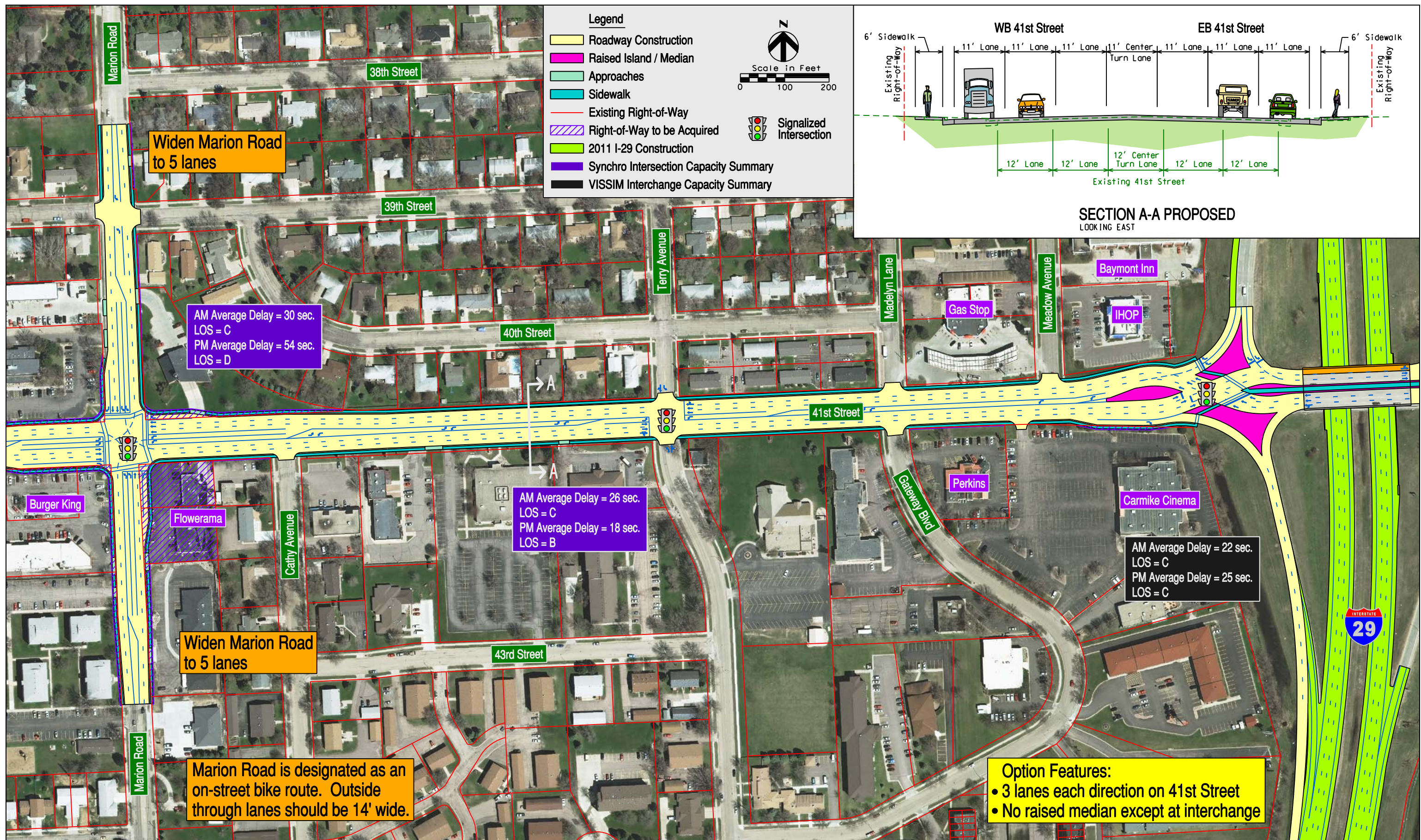


41st Street from Marion Road to Interstate 29
Improvement Option B

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
6-2B



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41st Street from Marion Road to Interstate 29
Improvement Option C

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
6-2C

Segment 3 – 41st Street from I-29 to Louise Avenue (Figures 6-3A to 6-3E)

Existing Conditions

As shown on Figure 4-1b, existing 41st Street is 3 lanes in each direction from I-29 to Louise Avenue with a center two-way left turn lane. There are no right turn lanes along 41st Street in this segment except at the westbound approach to the Louise Avenue intersection. The 3rd eastbound through lane begins at the I-29 southbound off-ramp. The 3rd westbound lane ends at the I-29 northbound on-ramp.

Both sides of 41st Street are lined with commercial properties with multiple access driveways to those properties. The Empire Mall has 3 access roadways to and from 41st Street. These roadways are on private property.

The existing average daily traffic volume is in the range of 30,000 to 33,000 vehicles. With the high traffic volumes and multiple access points, this stretch of 41st Street is one of the most congested and difficult to comfortably navigate arterial roadways in Sioux Falls and in South Dakota. Drivers typically have to wait through more than 1 signal cycle at each intersection during weekday PM peak hour periods. Saturday traffic volumes are similar to the weekday PM peak hour but generally extend for several hours; therefore, drivers often perceive Saturday traffic to be worse than the weekday PM peak hour.

One of the main detriments to smooth traffic flow on this segment of 41st Street is the close signal spacing at the I-29 northbound ramps, West Empire Place, and Shirley Avenue. The close spacing deters efficient timing of the signal phases for traffic progression.

The misalignment of Shirley Avenue on the north side of 41st Street and the Empire Mall entrance roadway on the south side of 41st Street also results in inefficient operation of the intersection. Westbound left turns to the Empire Mall roadway are prohibited at this intersection, although drivers are periodically observed making the left turn anyway. Only right turns are allowed onto 41st Street from the Empire Mall entrance roadway.

The intersection of 41st Street and Louise Avenue is the busiest intersection in Sioux Falls and in South Dakota and experiences poor operations during peak hours. It is not uncommon to see queues radiating out for blocks from this location during late weekday afternoons and weekends. The intersection provides dual left turn lanes on all approaches. A right turn lane is provided for the westbound to northbound movement; the right turn lane often back-fills with vehicles and ends up blocking the outside through lane on 41st Street.

The existing sidewalks along 41st Street in this segment are at back of curb. Few of the adjacent sites have good pedestrian accommodations. The Empire Mall entrance roadways do not have sidewalks. Crossing 41st Street, especially at Louise Avenue is difficult because of the long crossing distance (9 lanes).

Year 2035 No-Build Conditions

Since minimal additional development is anticipated east of I-29 along the 41st Street corridor, increases in traffic are projected to be minor. For this study, the City of Sioux Falls Travel Demand Forecast Model predicts year 2035 average daily traffic volume in the range of 33,000 to 35,000 vehicles, or approximately 10 percent higher than the existing volumes. While that increase is not significant, traffic operations on 41st

Street from I-29 to Louise Avenue are generally poor and even a slight increase in traffic, without any capacity improvements, will exponentially worsen traffic operations on 41st Street.

Concept Improvement Options

Investigation of improvement alternatives at 41st/Louise used the following logical sequence:

1. How many lanes would be required to provide acceptable level of service in 2035?
2. Is the intersection configuration required for acceptable level of service realistic?
3. If widening is not realistic, what level of congestion are we willing to accept?
4. If widening is not realistic, what other alternatives are available?

The ability to improve operations at 41st/Louise with traditional widening strategies, however, is limited by the location of adjacent businesses. Additional widening would likely require the acquisition and relocation of high-dollar commercial properties.

One concept improvement studied in the past was a back access roadway on the north side of Walgreens and extending behind the 41st Street businesses east of Louise Avenue. Access to and from the back access roadway would be very difficult because of its close proximity to the 41st/Louise intersection. In addition, during the business/landowner meetings, it was learned that mutual access agreements between the business owners would be very difficult to secure. Therefore this back access roadway is not proposed in this study.

Another concept improvement studied in the past was a “continuous flow intersection” configuration at the 41st/Louise intersection. While this unique intersection type could reasonably accommodate the traffic, right-of-way impacts were considered prohibitive to the properties adjacent to the intersection. Therefore, the “continuous flow intersection” configuration was not considered in this study.

Five specific concept improvement options for this segment of 41st Street have been developed and are discussed below and illustrated in Figures 6-3A to 6-3E. Common aspects of all options:

- Maintain the 3 through lanes on 41st Street
- Modify the Walmart entrance to provide a better connection between Shirley Avenue and Louise Avenue
- Five options for Carolyn Avenue access have been developed and are illustrated on Figures 6-3F and 6-3G. A separate analysis was conducted for the 41st Street/Carolyn Avenue intersection. The technical memoranda documenting the analysis are provided in Appendix A. All of these options will need to be examined in greater depth in the Interchange Modification Report to be prepared when the interchange project is identified in the SDDOT Transportation Improvement Program.

Option 3A – Raised Median on 41st with Triple Left Turn and Through Lanes at Louise (Figure 6-3A)

This option features:

- Raised median on 41st Street from I-29 to Louise Avenue
- Raised median on Louise Avenue within the limits of the intersection turn lanes
- Shirley Avenue realignment
- Dual left turn lanes at all approaches to the 41st Street/Shirley Avenue intersection
- Triple left turn and through lanes on Louise Avenue at 41st Street
- Right turn lanes on all approaches at the 41st Street/Louise Avenue intersection

Benefits of this option include:

1. Restriction of left turn movements would improve safety on 41st Street and Louise Avenue.
2. Level of service D is achieved at the Shirley Avenue and Louise Avenue intersections with year 2035 traffic conditions.
3. The raised medians on 41st Street and Louise Avenue would provide a pedestrian refuge at all signalized intersection crossings.

Drawbacks of this option include:

1. Access to commercial properties along 41st Street and Louise Avenue in the vicinity of the 41st Street intersection would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access.
2. Triple left turn movements are rare throughout the United States and would likely have operational inefficiencies at this location, especially since high volume commercial driveways near the intersection result in inefficiencies of the existing dual left turn lanes.
3. With the additional turn lanes and raised median, right-of-way would need to be acquired along 41st Street and Louise Avenue. The acquisitions at the 41st Street/Louise Avenue intersection would likely be devastating to the existing businesses. Total property acquisitions may be necessary at the northeast corner of 41st and Shirley.

Option 3B – Raised Median on 41st with Triple Left Turn Lanes at Louise (Figure 6-3B)

This option features:

- Raised median on 41st Street from I-29 to Louise Avenue
- ¾ movement configuration at West Empire Place
- Raised median on Louise Avenue within the limits of the intersection turn lanes
- Shirley Avenue realignment
- Dual left turn lanes at all approaches to the 41st Street/Shirley Avenue intersection
- Triple left turn lanes on Louise Avenue at 41st Street

Benefits of this option include:

1. Restriction of left turn movements would improve safety on 41st Street and Louise Avenue.
2. The raised medians on 41st Street and Louise Avenue would provide a pedestrian refuge at all signalized intersection crossings.
3. The ¾ movement configuration at West Empire Place allows for better signal timing coordination and accompanying better progression of traffic flow between I-29 and Shirley Avenue.

Drawbacks of this option include:

1. Without the triple through lanes on Louise Avenue and the free right turn lanes at the 41st Street/Louise Avenue intersection, only level of service F is achieved at the 41st/Louise intersection with year 2035 traffic conditions.
2. Access to commercial properties along 41st Street and Louise Avenue in the vicinity of the 41st Street intersection would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access.
3. Triple left turn movements are rare throughout the United States and would likely have operational inefficiencies at this location.

4. With the additional turn lanes and raised median, right-of-way would need to be acquired along 41st Street and Louise Avenue. The right-of-way acquisition would not be as significant or as detrimental as Option A. Total property acquisitions may be necessary at the northeast corner of 41st and Shirley.

Option 3C – No Raised Median on 41st and No Added Capacity (Figure 6-3C)

This option features:

- No added capacity on 41st Street
- Shirley Avenue realignment with expansion of the mall entrance road across from Shirley Avenue.
- Re-striping 41st Street to allow dual left turn lanes at Shirley Avenue is illustrated in the animation. This would improve operation of the intersection.
- The main Empire Mall entrance to/from 41st Street would be at Shirley Avenue.

An animation of this option with year 2035 PM Peak hour traffic can be viewed at: [Animations\Option C 41st from I-29 to Louise Yr 2035 PM Peak.wmv](#)

Benefits of this option include:

1. No property acquisitions would be necessary along 41st Street
2. No physical barrier (raised median) would prohibit left turning traffic onto and off of 41st Street east of the DDI northbound ramp intersection
3. Most business/landowners preferred this option.

Drawbacks of this option include:

1. With no capacity improvements, traffic congestion on 41st Street will continue to get worse.
2. Realignment of Shirley Avenue may necessitate total acquisition of the properties at the northeast corner of 41st and Shirley.

Other than the realignment and expansion of the Shirley Avenue intersection, this option represents a no-build scenario. Although this option does not improve safety or level of service, right-of-way constraints along 41st Street and at the Louise Avenue intersection require that this option be considered technically feasible.

Option 3D – Raised Median on 41st with No Added Capacity at Louise Avenue (Figure 6-3D)

This option features:

- Raised median on 41st Street from I-29 to Shirley Avenue
- ¾ movement configuration at West Empire Place
- Shirley Avenue realignment
- One-way pair entrance roads to the Empire Mall
- No added capacity at Louise Avenue

An animation of this option with year 2035 PM Peak hour traffic can be viewed at: [Animations\Option D 41st from I-29 to Louise Yr 2035 PM Peak.wmv](#)

Benefits of this option include:

1. Restriction of left turn movements between I-29 and Shirley Avenue would improve safety on 41st Street.
2. The raised median on 41st Street would provide a pedestrian refuge at the Shirley Avenue intersection crossing.
3. The ¾ movement configuration at West Empire Place allows for better signal timing coordination and accompanying better progression of traffic flow between I-29 and Shirley Avenue.
4. The one-way pair concept for the Empire Mall entrance roadways improves traffic flow on 41st Street and minimizes the widths of the entrance roadways.
5. Property acquisitions are reduced compared to Options 3A and 3B.

Drawbacks of this option include:

1. Access to commercial properties along 41st Street from I-29 to Shirley Avenue would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access.
2. Without any improvements at the 41st Street/Louise Avenue intersection, traffic congestion will remain at level of service F with average delay per vehicle increasing from 94 seconds now to 166 seconds in year 2035. As shown on Figure 6-3B, the traffic analysis did indicate that restriping the intersection to allow for dual right turns for the westbound to northbound movement would improve operation of the intersection.
3. With the additional turn lanes and raised median, right-of-way would need to be acquired along 41st Street between I-29 and Shirley Avenue. Total property acquisitions may be necessary at the northeast corner of 41st and Shirley.
4. Vehicle safety is compromised by allowing left turn movements along 41st Street east of Shirley Avenue. The same discussion regarding the safety benefits of the raised median that was presented for Segment 1 applies to this option for Segment 3.
5. No raised median to provide a pedestrian refuge at Louise Avenue

At the 41st/Louise intersection this option represents a no-build scenario. Although this option does not improve safety or level of service at the intersection, right-of-way constraints require consideration of this option.

Option 3E – Raised Median on 41st with Center Turn Overpass at Louise Avenue (Figure 6-3E)

This option features:

- Raised median on 41st Street
- ¾ movement configuration at West Empire Place
- Shirley Avenue realignment
- One-way pair entrance roads to the Empire Mall
- Center turn overpass structure at 41st and Louise intersection

The Center Turn Overpass is a concept that was developed in the late 1990’s and was granted a patent. The patent owner was contacted and permission was granted to utilize the concept for the 41st Street corridor study. The main feature of the Center Turn Overpass is that the left turning traffic utilizes ramp structures

to get to an elevated intersection solely for left-turning vehicles, therefore only single left turn lanes are needed. Through and right-turning traffic remains on the at-grade roadways. The elevated and at-grade movements have separate signals so operation of the intersection is very efficient. A rendering of a generic center turn overpass is shown on Figure 6-3E. An animation of a generic center turn overpass can be viewed by clicking this link: [Animations\Center turn overpass generic.wmv](#)

Although the center turn overpass concept has been considered at several locations in the United States, none have yet been built. At the 41st Street/Louise Avenue intersection, it is the only improvement concept for the intersection yet analyzed that accommodates the traffic without catastrophic impacts to the adjacent properties. More information on the center turn overpass is available at this web site: http://attap.umd.edu/UAID_gss.php?UAIDType=13&iFeature=3

An animation of this option with year 2035 PM Peak hour traffic can be viewed at: [Animations\Option E 41st from I-29 to Louise Yr 2035 PM Peak.wmv](#)

Microsimulation modeling on this option showed better traffic operations with an exclusive westbound lane on 41st Street for the Center Turn Overpass at Shirley Avenue as shown on Figure 6-3E. This is because the relatively high volume of Louise northbound to 41st westbound drivers cannot merge into the inside 41st Street lane before the Shirley Avenue intersection and backups were observed all the way to the signal on the Center Turn Overpass ramp. Reducing westbound 41st Street to two through lanes at Shirley Avenue did not significantly impact overall traffic operations.

Benefits of this option include:

1. Restriction of left turn movements would improve safety on 41st Street and Louise Avenue.
2. Level of service D or better is achieved at all intersections with year 2035 traffic conditions.
3. The raised median on 41st Street would provide a pedestrian refuge at the Shirley Avenue intersection crossing.
4. The Center Turn Overpass configuration is expected to be “pedestrian friendly”.
5. The ¾ movement configuration at West Empire Place allows for better signal timing coordination and accompanying better progression of traffic flow between I-29 and Shirley Avenue.
6. The one-way pair concept for the Empire Mall entrance roadways improves traffic flow on 41st Street and minimizes the widths of the entrance roadways.
7. Property acquisitions are reduced compared to Options 3A and 3B.

Drawbacks of this option include:

1. Access to commercial properties along 41st Street and Louise Avenue in the vicinity of 41st Street intersection would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access.
2. Visibility of adjacent properties would be reduced by the overpass structures.
3. The cost of the overpass structure at 41st and Louise is estimated at \$9 million.
4. Since no Center Turn Overpass configurations have been built, many aspects of the actual operation are unknown.
5. Winter maintenance concerns and snow removal costs for the structure could be extensive given South Dakota’s climate.

Consultant Recommended Option(s)

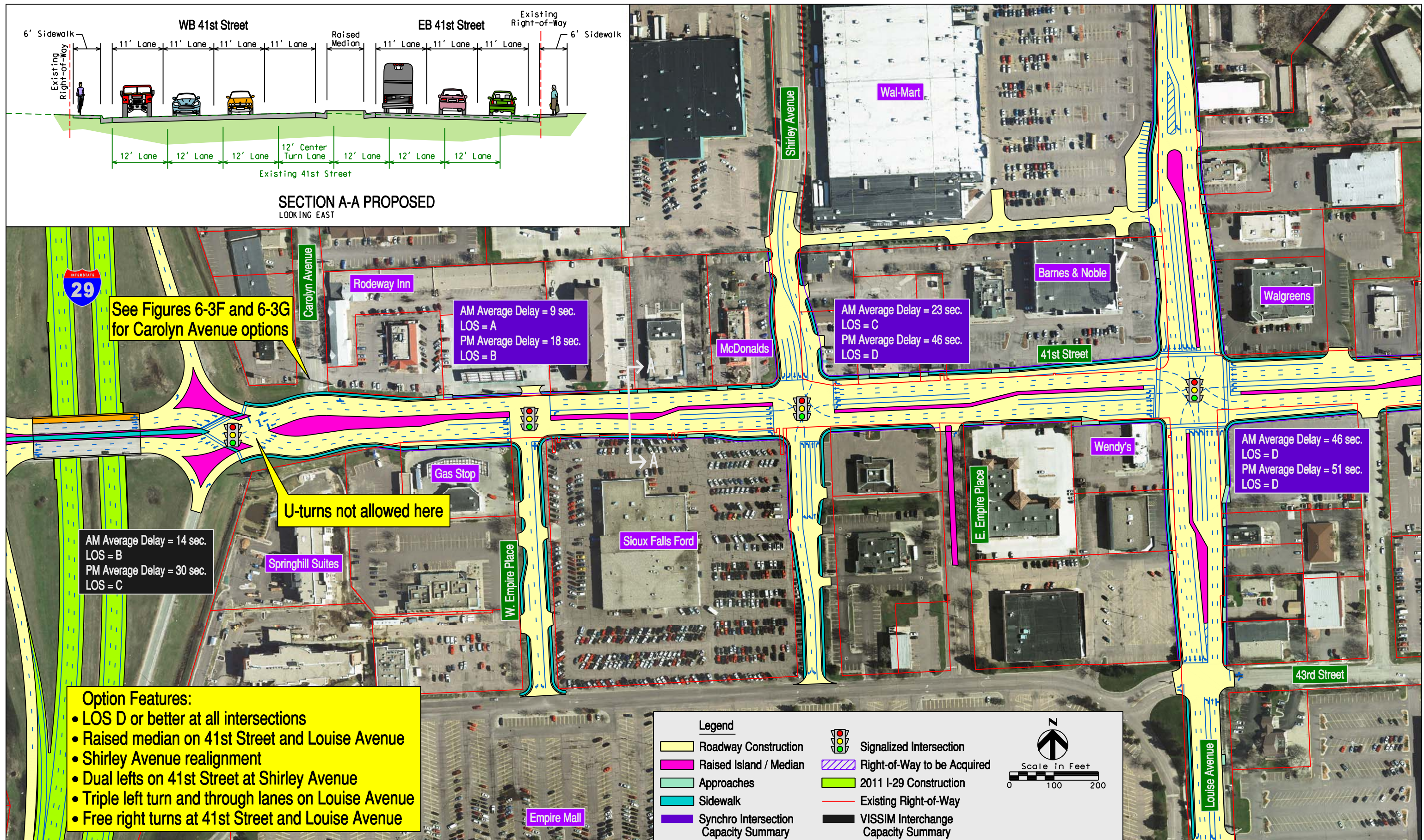
Options 3D and 3E are recommended for this corridor segment. Option 3D essentially becomes Option 3E with the addition of the Center Turn Overpass; therefore this recommendation could be constructed in phases. These are the only options that adequately accommodate future traffic without catastrophic right-of-way impacts. It is anticipated that if traffic conditions on 41st Street deteriorate far enough, business/landowners along 41st Street and Louise Avenue would be willing to accept the left turn restrictions inherent to these options. The Center Turn Overpass has the most benefit for traffic operations and safety at the intersection. A more in-depth analysis will be necessary to determine if the drawbacks can be overcome and if the cost of the Center Turn Overpass structure is warranted. Construction and monitoring of operations at another Center Turn Overpass type of facility in the United States should precede development of a Center Turn Overpass at 41st Street/Louise Avenue.

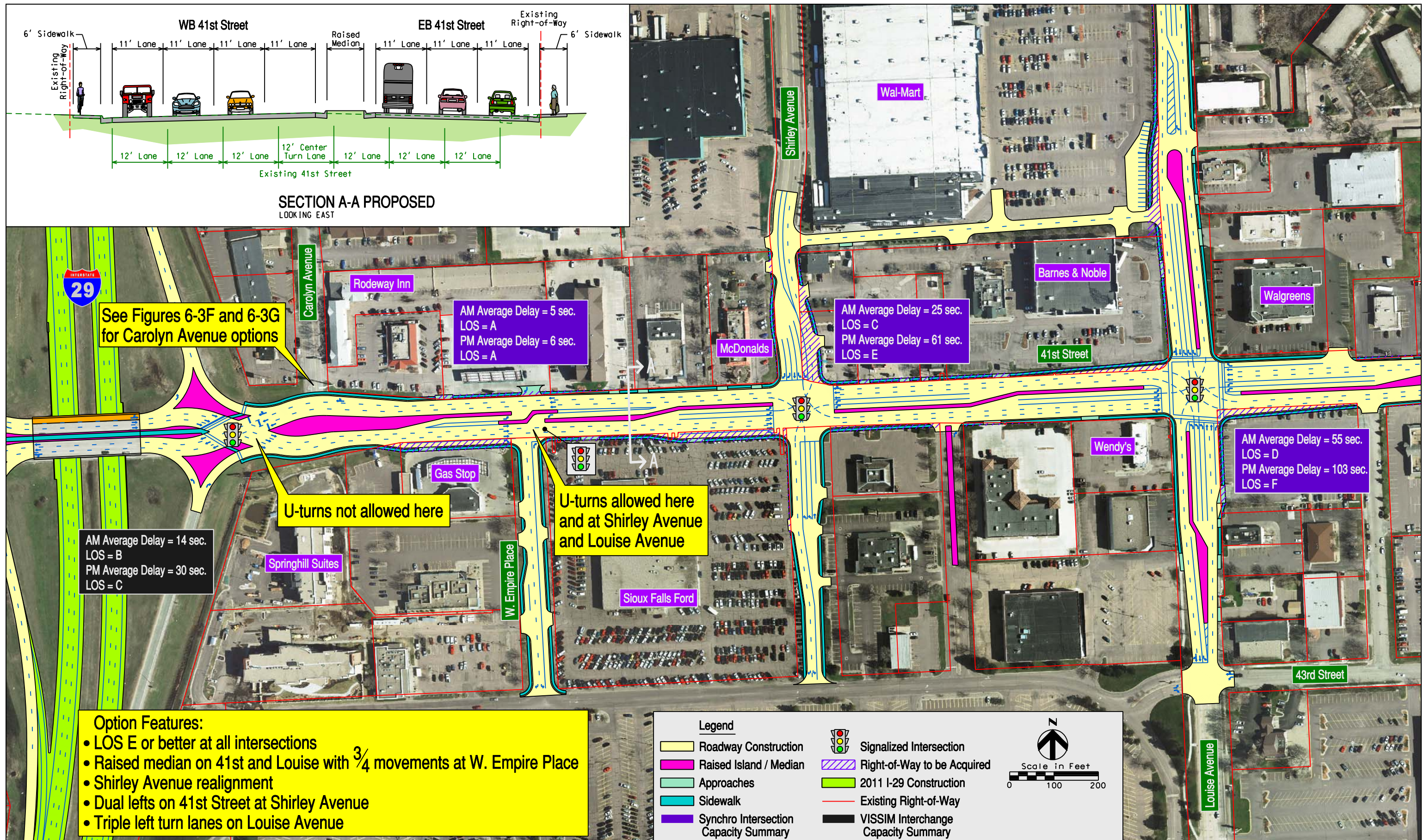
Table 6 – Segment 3 Concept Options Comparison

Option	A - Raised median and triple thru/lefts	B - Raised median and triple lefts	C – No expansion realign Shirley	D - Raised median to Shirley leave 41 st /Louise one-ways	E - Center Turn Overpass one- ways
Year 2035 Intersection Traffic Operations (PM Peak hour)					
I-29 NB off-ramp (1)					
LOS	C	C	C	C	C
Avg. Delay (seconds)	30	30	30	30	30
West Empire Place					
LOS	B	A	B	A	A
Avg. Delay (seconds)	18	6	17	8	8
Shirley Avenue					
LOS	D	E	F	D	D
Avg. Delay (seconds)	46	61	83	35	35
Louise Avenue (2)					
LOS	D	F	F	F	C
Avg. Delay (seconds)	51	103	125	125	(3)
Roadway Safety	Moderate	Moderate	Poor	Moderate	Good
Right-of-Way Impacts	Major (1.76 ac)	Moderate (1.35 ac)	Moderate (0.43 ac)	Minimal (0.74 ac)	Moderate (1.26 ac)
Construction Cost (million \$)	Moderate (9.0)	Moderate (8.9)	Low (1.0)	Moderate (3.7)	High (17.8)
Ease of Construction	Moderate	Moderate	Simple	Simple	Complex
Traffic Impacts during Construction	Major	Major	Minimal	Moderate	Major
Business/landowner Acceptance	Poor	Poor	Good	Moderate	Moderate
Expected Driver Acceptance	Poor	Poor	Moderate	Moderate	Unknown
Meets design guidelines	Yes	Yes	No	Partially	Yes
Pedestrian benefits	Good	Good	Moderate	Moderate	Good

Notes:

- (1) Existing: LOS=F, delay=86 sec.; Yr 2035 No-build: LOS=F, delay = 307 seconds
- (2) Existing: LOS=F, delay=86 sec.; Yr 2035 No-build: LOS=F, delay = 183 seconds
- (3) Through and right turn lanes: LOS=C, delay=25 sec; elevated left turn lanes LOS=C, delay=20 sec





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Federal Highway Administration



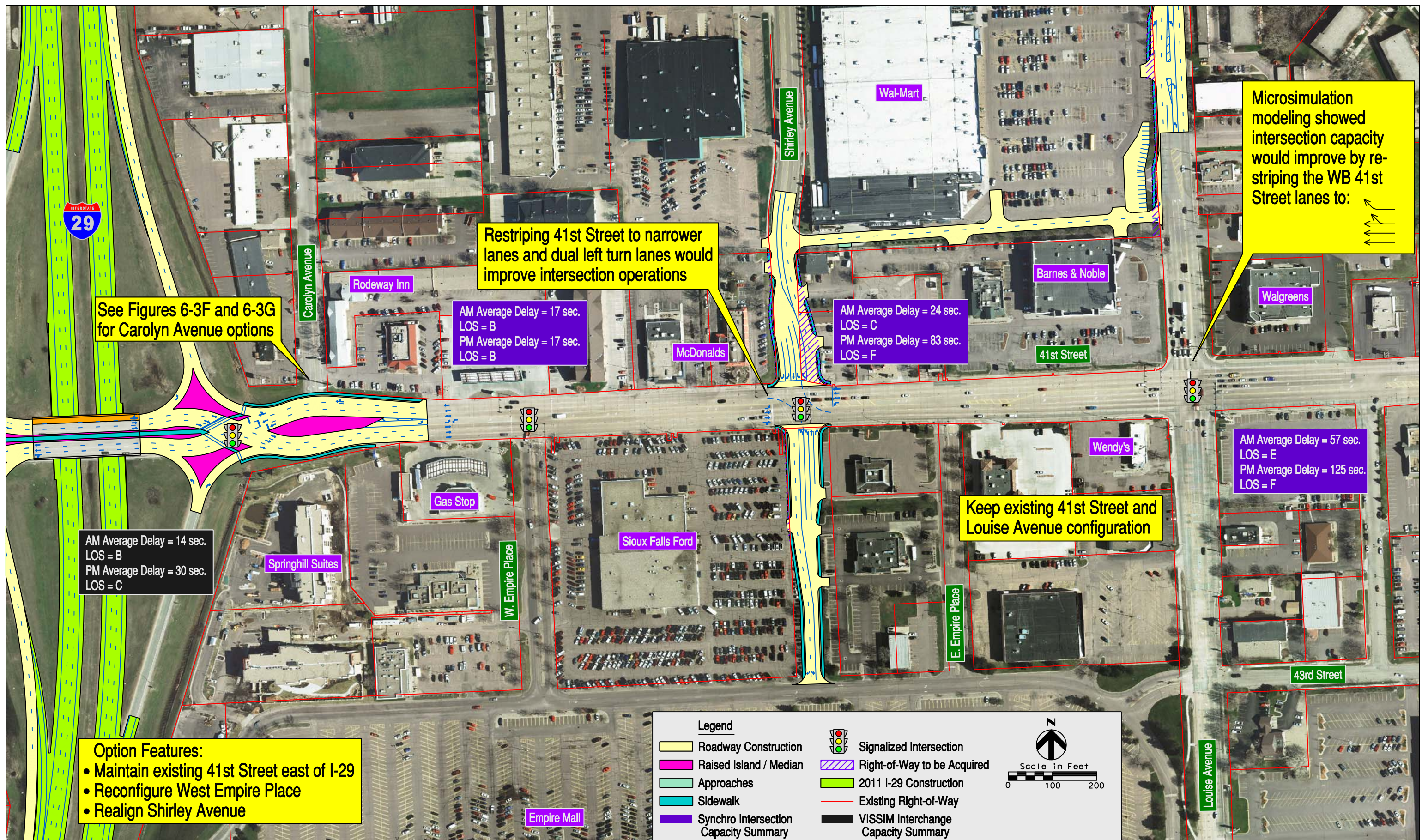
HDR

41st Street from Interstate 29 to Louise Avenue
Improvement Option B

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
6-3B



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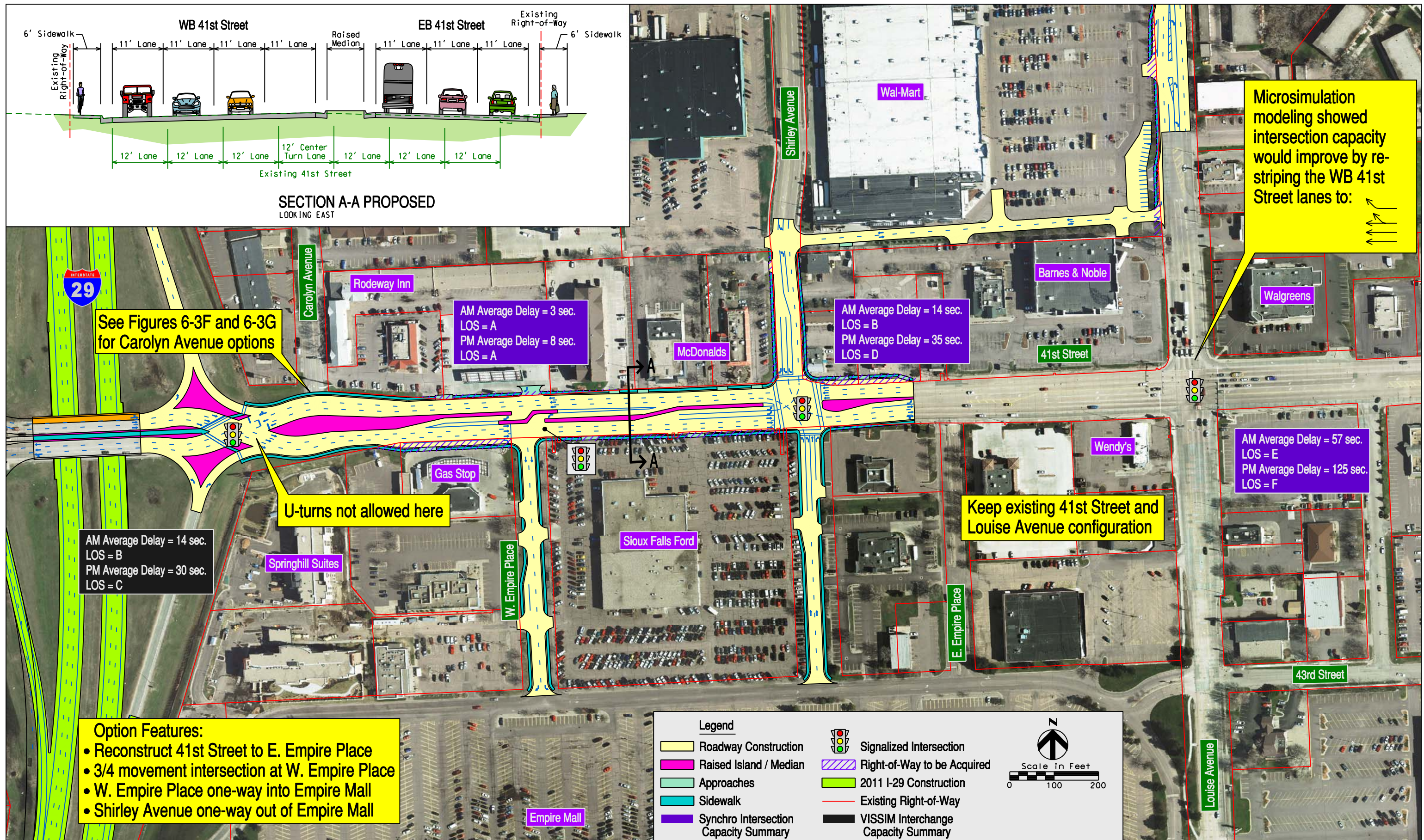
HDR

41st Street from Interstate 29 to Louise Avenue
Improvement Option C

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
6-3C



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Date: 9-21-2011
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Date: 9-21-2011
Revisions: 5-29-12

U.S. Department of Transportation
Federal Highway Administration



HDR

41st Street from Interstate 29 to Louise Avenue
Improvement Option D

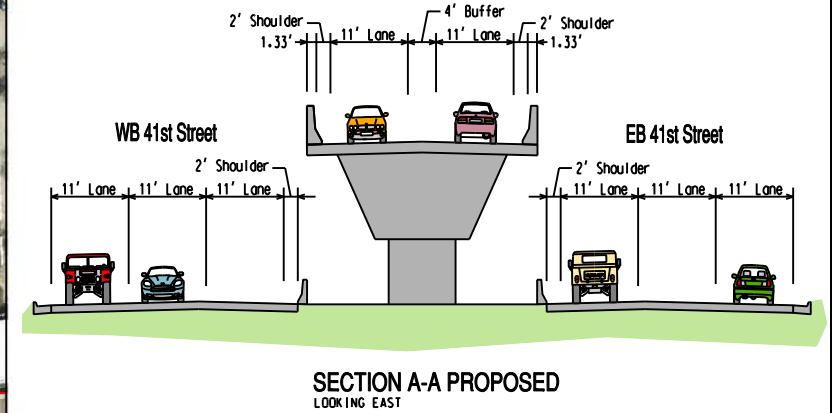
I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
6-3D



Center Turn Overpass Rendering



Drawn By: B. Miller
Date: 9-21-2011

Checked By: J. Unruh
Date: 9-21-2011

Revisions: 5-29-12

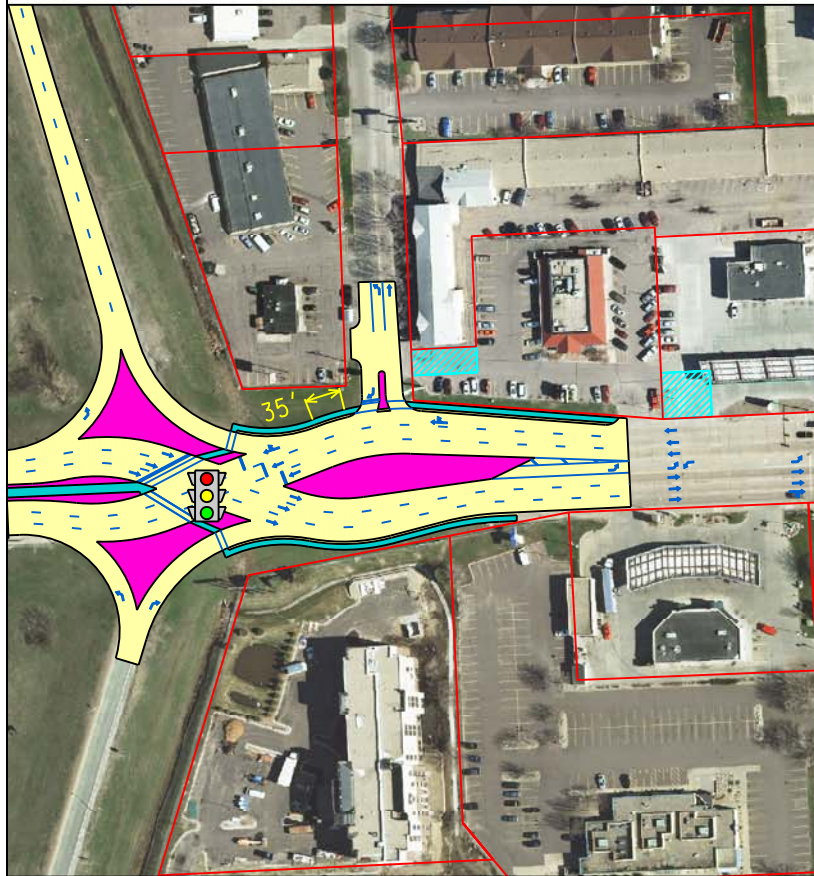
Legend

- Roadway Construction
- Raised Island / Median
- Sidewalk
- Access Easement
- Existing Right-of-Way

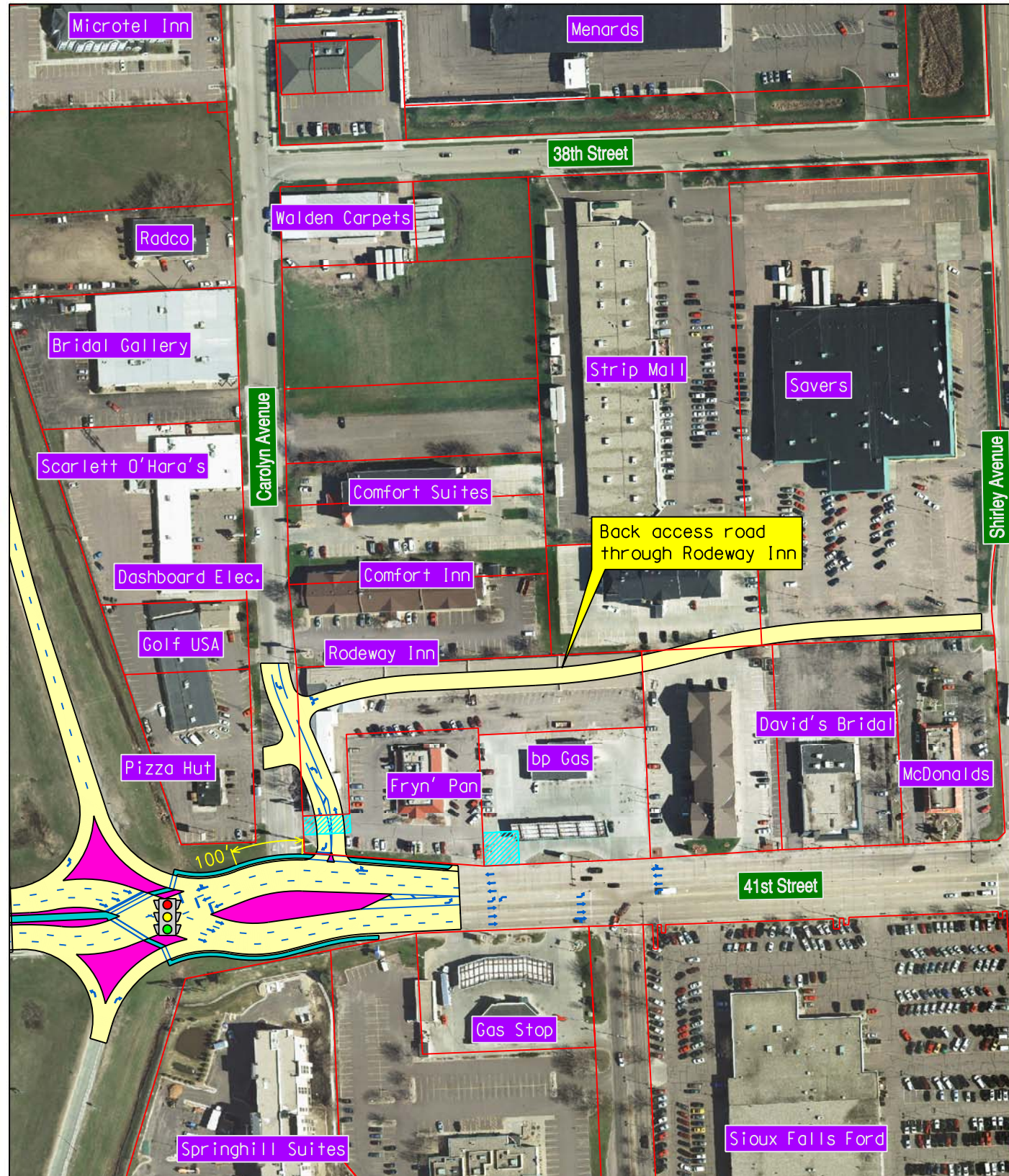
Scale in Feet

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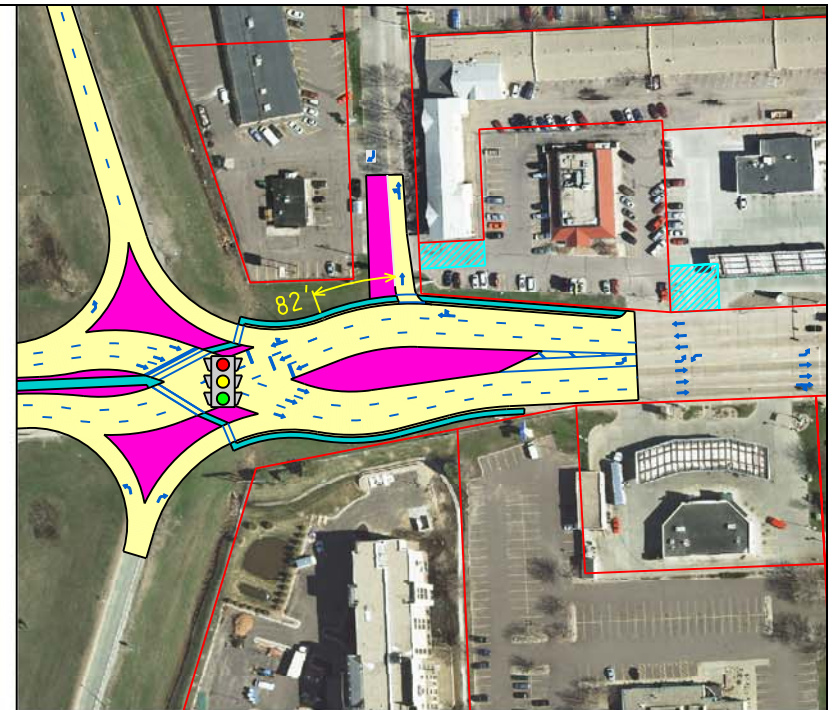
Signalized Intersection



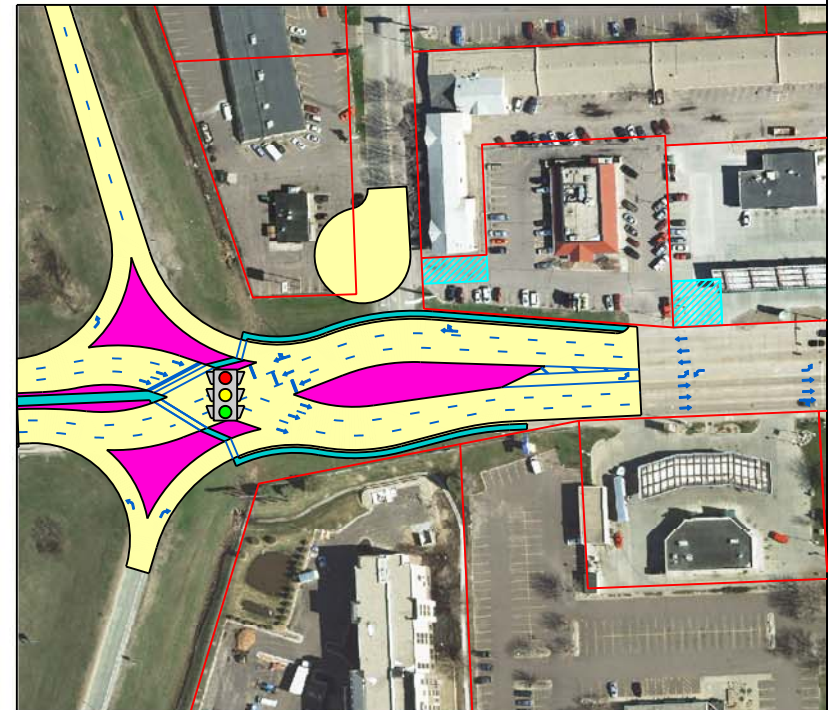
Option 1
 Right-in / Right-out at existing Carolyn Avenue
 Inadequate spacing to I-29 ramp therefore not desirable



Option 2
 Right-in / Right-out with realigned Carolyn Avenue
 Back access constructed through Rodeway Inn



Option 3
 Right-in only at existing Carolyn Avenue



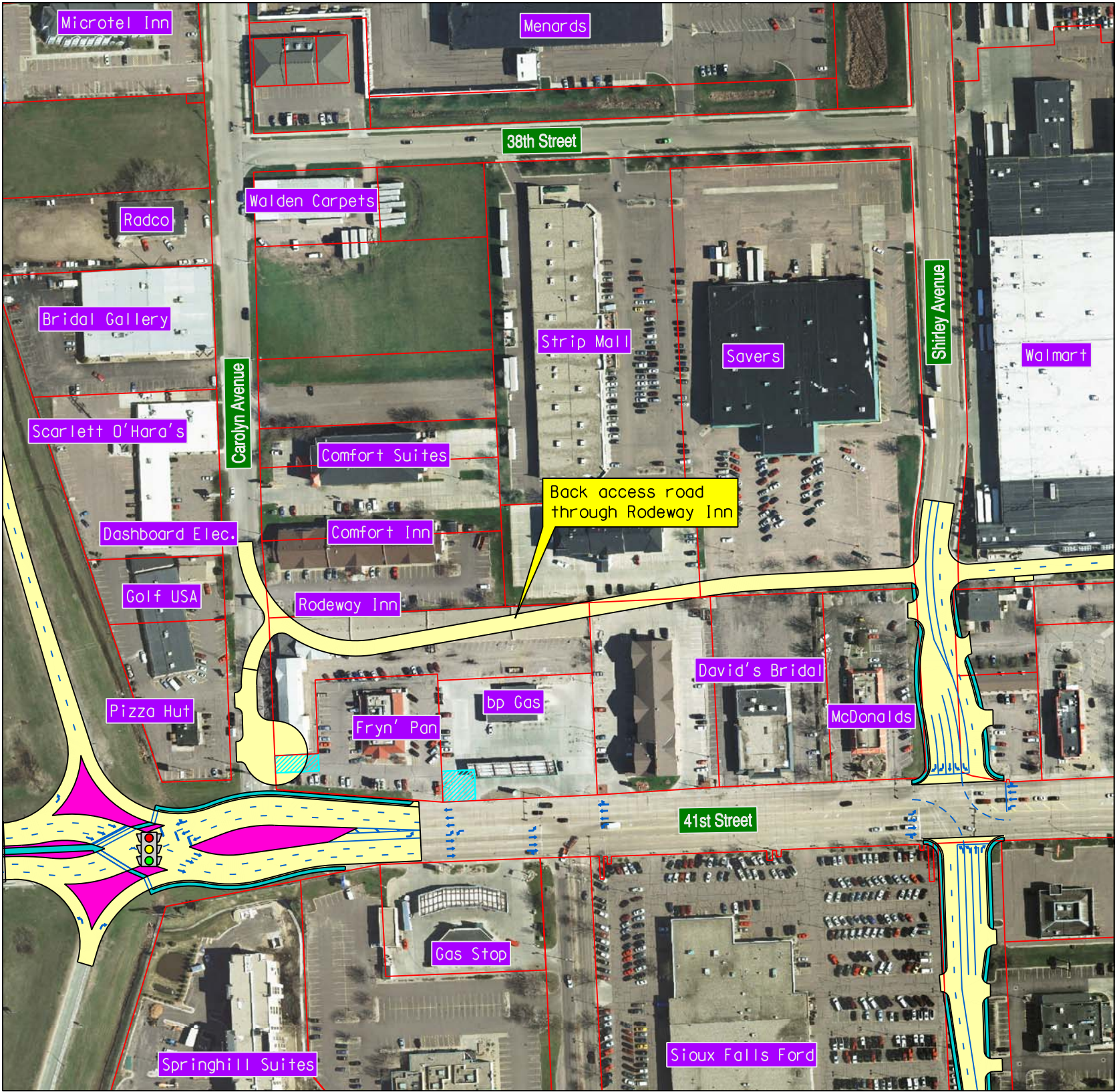
Option 4
 Cul-de-sac Carolyn Avenue

Legend

- Roadway Construction
- Raised Island / Median
- Sidewalk
- Access Easement
- Existing Right-of-Way

Scale in Feet
0 100 200

Signalized Intersection



Option 5
Close Carolyn Avenue at 41st Street
Back access constructed through Rodeway Inn

Segment 4 – 41st Street from east of Louise Avenue to Kiwanis Avenue (Figures 6-4A to 6-4E)

Existing Conditions

As shown on Figure 4-1b, existing 41st Street is 3 lanes in each direction from Louise Avenue to Kiwanis Avenue with a center two-way left turn lane. There are no right turn lanes along 41st Street in this segment except at the eastbound entrance to the south side development east of Kiwanis Avenue. The 3rd lanes begin/end at Kiwanis Avenue.

The south side of 41st Street is lined with commercial properties with multiple access driveways to those properties. The north side of 41st Street is lined with commercial properties with multiple access driveways between Louise Avenue and the Big Sioux River. The O’Gorman High School athletic complex is on the north side of 41st Street between the Big Sioux River and Kiwanis Avenue.

The existing average daily traffic volume is just over 41,000. There are three main operational problems in this segment of 41st Street:

1. Making left turns into and out of the driveways along 41st Street is very difficult throughout the daytime and particularly during peak traffic periods. On the south side of 41st Street, 43rd Street west of the Big Sioux River and West Park Place Circle east of the Big Sioux River serve as back access roadways which many drivers use to get to the signals at Louise Avenue and Kiwanis Avenue to make left turns. Based on feedback at the business/landowner meetings, improvements to West Park Place Circle would be needed to provide adequate back access to all of the businesses.
2. For eastbound 41st Street, the 3rd through lane turns into a left turn lane to north Kiwanis Avenue. Drivers often get inadvertently trapped in that lane and attempts to get out into an eastbound through lane near the signal have resulted in crashes.
3. PM peak hour counts show 1000 vehicles making the movement from southbound Kiwanis to westbound 41st Street. Many of the drivers weave across the 2 lanes of 41st Street traffic to make a left turn at Louise Avenue. This results in erratic speeds and unsafe weaving maneuvers.

The 41st Street bridge across the Big Sioux River was reconstructed in 2010 as part of a flood control project. The bridge and roadway on each side of the bridge were reconstructed with 3 through lanes and a center two-way left turn lane. As part of that project, additional turn lanes were added at the West Park Place Circle/Kiwanis Avenue intersection. These turn lanes have been beneficial to drivers using West Park Place Circle as a back access road to the businesses along 41st Street.

The existing sidewalks along 41st Street in this segment are at back of curb. The sidewalk connects to the Big Sioux River bike trail on the east side of the river.

Year 2035 No-Build Conditions

Since minimal additional development is anticipated east of I-29 along the 41st Street corridor, increases in traffic are projected to be minor. For this study, the City of Sioux Falls Travel Demand Forecast Model predicts year 2035 average daily traffic volume of just over 44,000 vehicles, or approximately 7 percent higher than the existing volumes. The traffic analysis did not show a significant deterioration in intersection operation with delay increasing from existing 103 seconds to 122 seconds for year 2035 no-build conditions.

Concept Improvement Options

Five specific concept improvement options for this segment of 41st Street have been developed and are discussed below and illustrated in Figures 6-3A to 6-3E. Common aspects of all options:

- Maintain the 3 through lanes on 41st Street
- Maintain a separate lane for traffic from southbound Kiwanis to westbound 41st Street. The traffic analysis showed that attempting to merge the southbound traffic into a 41st Street through lane resulted in long backups on Kiwanis Avenue.
- Maintain the center two-way left turn lane within the limits of the 2010 Big Sioux River reconstruction project.
- Extend the eastbound 41st Street through lane across Kiwanis Avenue to eliminate the left turn “trap lane”. The extension of this 3rd lane should be as far as possible east of Kiwanis before narrowing to 2 lanes so vehicles can safely merge.

Several of the options show a right turn lane for westbound 41st Street to northbound Kiwanis Avenue. On the concept layouts, this turn lane is shown as fairly short due to right-of-way impacts. However, it should be noted that this lane needs to be long enough to allow for right turning vehicles to get around the queue of through vehicles at the intersection. Acquisition of the entire parcel at the northeast corner of 41st/Kiwanis is likely necessary to provide a right turn lane of sufficient length to be beneficial.

One concept improvement studied in the past was a connection road across the Big Sioux River from 43rd Street to West Park Place Circle. That concept is no longer considered technically feasible due to bridge costs, right-of-way impacts, and capacity constraints on Kiwanis Avenue south of 41st Street.

Option 4A – Triple Left Turn lanes EB to NB and 3 WB through lanes (Figure 6-4A)

This option features:

- Triple left turn lanes for the eastbound 41st Street to northbound Kiwanis Avenue movement
- Three through lanes for westbound 41st Street at Kiwanis Avenue
- Raised median on 41st Street within the limits of the Kiwanis Avenue intersection turn lanes

Benefits of this option include:

1. Level of service D is achieved at the 41st/Kiwanis intersection with year 2035 traffic conditions.
2. Restriction of left turn movements with the raised median would eliminate the left turn movements into and out of adjacent properties. These movements are difficult and dangerous to make with the high traffic volumes.

Drawbacks of this option include:

1. Triple left turn movements are rare throughout the United States and would likely have operational inefficiencies at this location.
2. Drivers making the movement from southbound Kiwanis to westbound 41st Street would be forced to weave across the 3 lanes of 41st Street traffic to make a left turn at Louise Avenue. Drivers now have to weave across 2 lanes of 41st Street traffic.

3. Access to commercial properties along 41st Street in the vicinity of Kiwanis Avenue would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access. It should be pointed out that during peak traffic periods, access to properties is essentially restricted to right-in/right-out movements.
4. With the additional turn lane and raised median, right-of-way would need to be acquired along 41st Street and Kiwanis Avenue. The property at the northeast corner of the 41st and Kiwanis would be a total acquisition. McEneany Field would also be impacted with this option.

Option 4B – 3 Westbound Through Lanes at Kiwanis and Raised Median (Figure 6-4B)

This option features:

- Maintain dual left turn lanes for the eastbound 41st Street to northbound Kiwanis Avenue movement
- Three through lanes for westbound 41st Street at Kiwanis Avenue
- Raised median on 41st Street within the limits of the Kiwanis Avenue intersection turn lanes

Benefits of this option include:

1. Three westbound through lanes on the east side of Kiwanis helps intersection operation.
2. Restriction of left turn movements with the raised median would eliminate the left turn movements into and out of adjacent properties. These movements are difficult and dangerous to make with the high traffic volumes.

Drawbacks of this option include:

1. Level of service E is the best that can be achieved at the 41st/Kiwanis intersection with year 2035 traffic conditions.
2. Drivers making the movement from southbound Kiwanis to westbound 41st Street would be forced to weave across the 3 lanes of 41st Street traffic to make a left turn at Louise Avenue. Drivers now have to weave across 2 lanes of 41st Street traffic.
3. Access to commercial properties along 41st Street in the vicinity of Kiwanis Avenue would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access.
4. With the additional westbound through lane and the raised median, right-of-way would need to be acquired along the north side of 41st Street. McEneany Field would also be impacted with this option.

Option 4C – No Raised Median and 2 Westbound Through Lanes with Right Turn Lane at Kiwanis (Figure 6-4C)

This option features:

- No raised median on 41st Street
- Maintain dual left turn lanes for the eastbound 41st Street to northbound Kiwanis Avenue movement
- Two through lanes and right turn lane for westbound 41st Street at Kiwanis Avenue

An animation of this option (looking east) with year 2035 PM Peak hour traffic can be viewed at:

[Animations\Kiwanis Option C 2 Lanes WB Yr 2035 PM Peak.wmv](#)

Benefits of this option include:

1. Left turn movements to and from businesses on 41st Street are not restricted by a raised median.
2. McEneany Field would not be impacted with this option.

Drawbacks of this option include:

1. Level of service E is the best that can be achieved at the 41st/Kiwanis intersection with year 2035 traffic conditions.
2. The difficult and dangerous left turn movements into and out of 41st Street business near the intersection are maintained.
3. Because of through lane stacking, the utilization of this right turn lane would be limited unless the lane extends from Kiwanis to South O’Gorman Drive. This would likely result in total acquisition of the property at the northeast corner of the 41st and Kiwanis intersection.

Option 4D – Same as Option 4C except with Raised Median (Figure 6-4D)

This option features:

- Maintain dual left turn lanes for the eastbound 41st Street to northbound Kiwanis Avenue movement
- Two through lanes and right turn lane for westbound 41st Street at Kiwanis Avenue
- Raised median on 41st Street within the limits of the Kiwanis Avenue intersection turn lanes

Benefits of this option include:

1. Restriction of left turn movements with the raised median would eliminate the left turn movements into and out of adjacent properties. These movements are difficult and dangerous to make with the high traffic volumes.
2. McEneany Field would not be impacted with this option.

Drawbacks of this option include:

1. Level of service E is the best that can be achieved at the 41st/Kiwanis intersection with year 2035 traffic conditions.
2. Access to commercial properties along 41st Street in the vicinity of Kiwanis Avenue would be restricted to right-in/right-out movements. Business/landowners that participated in the public involvement process were opposed to this restriction in access.
3. With the raised median and westbound right turn lane at Kiwanis, The property at the northeast corner of the 41st and Kiwanis would be a total acquisition.
4. Because of through lane stacking, the utilization of this right turn lane would be limited unless the lane extends from Kiwanis to South O’Gorman Drive. This would likely result in total acquisition of the property at the northeast corner of the 41st and Kiwanis intersection.

Option 4E – Flyover Ramp from EB 41st to NB Kiwanis (Figure 6-4E)

This option features:

- Flyover ramp from EB 41st to NB Kiwanis.

An animation of this option (looking east) with year 2035 PM Peak hour traffic can be viewed at: [Animations\Kiwanis Option E Flyover Ramp Yr 2035 PM Peak.wmv](#)

Benefits of this option include:

1. With the high volume eastbound to north bound left turn movement taken out of the signal by grade separation, the intersection operates at Level of Service C with relatively short average delays.
2. McEneany Field would not be impacted with this option.

Drawbacks of this option include:

1. The flyover ramp eliminates left turn access to and from the businesses on the south side of 41st Street and the east side of Kiwanis Avenue.
2. Access to the O’Gorman main entrance from northbound Kiwanis would be restricted because of the traffic from the flyover ramp.
3. The cost of the flyover ramp is estimated at \$3 million.
4. Winter maintenance concerns and snow removal costs for the structure could be extensive given South Dakota’s climate.

Consultant Recommended Option

With this segment HDR’s recommendation is more of a process of elimination of options than selection of an obvious desirable option.

Option 4A is not recommended because:

- The undesirability and property impacts of the triple left turn lanes
- The additional weaving caused by the 3rd westbound through lane

Option4B is not recommended because of the additional weaving caused by the 3rd westbound through lane.

Option 4D is not recommended because:

- The safety benefits of a short section of raised median at an intersection are debatable.
- Additional right-of-way would be needed for the raised median width.

Option 4E is not recommended due to the access impact at O’Gorman. If this impact can be addressed, then Option 4E would be the most desirable option for this corridor segment.

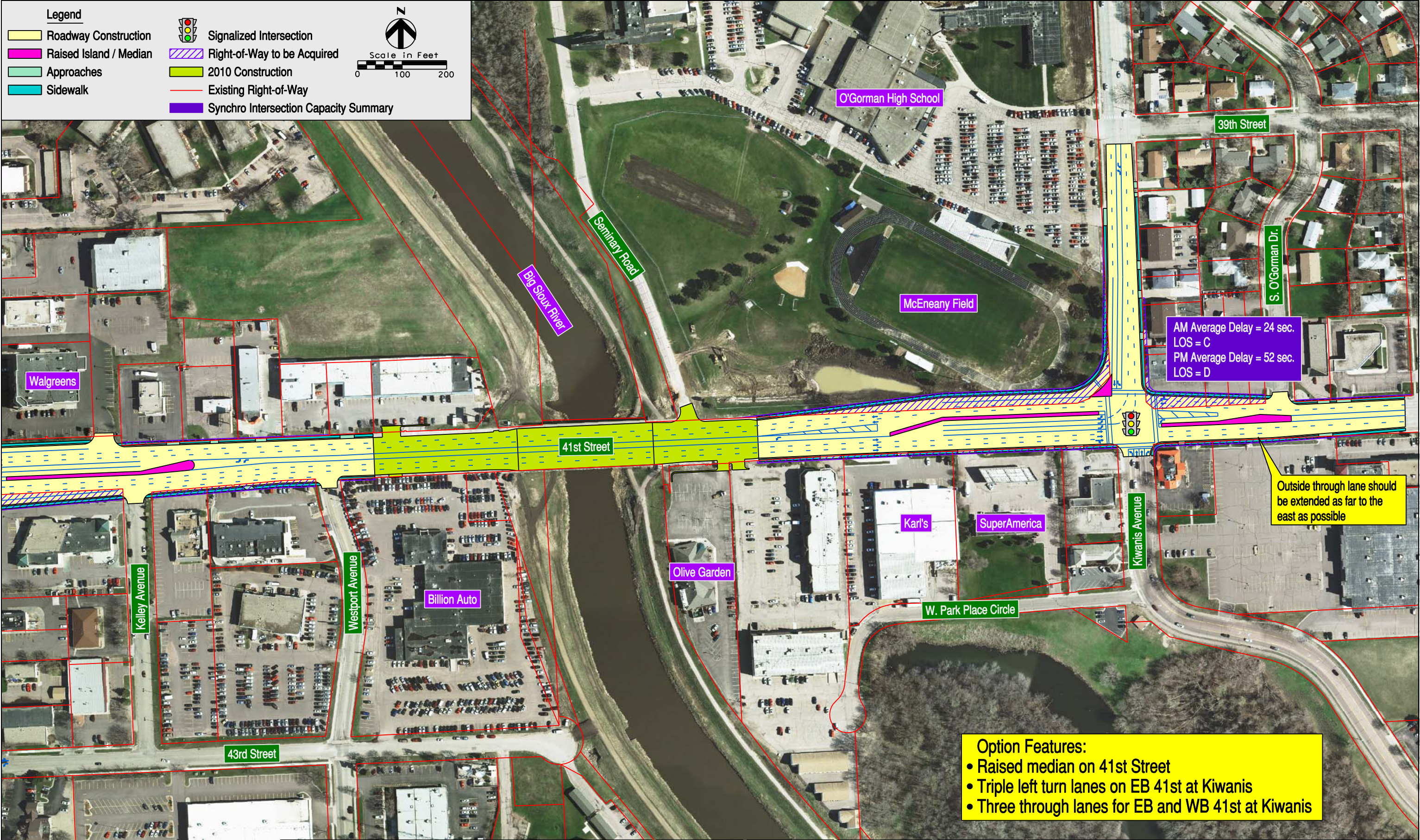
Option 4C is recommended for this corridor segment because of the elimination of the eastbound trap lane. To be effective, the additional 3rd eastbound lane needs to extend as far east of Kiwanis Avenue as possible.

Table 7 – Segment 4 Concept Options Comparison

Option	A - Triple lefts and 3 WB through lanes	B - Raised median and 3 WB through	C - No raised median and 2 WB through	D - Raised median and 2 WB through	E - Flyover ramp
Year 2035 Traffic Operations (PM Peak hour)					
Kiwanis Avenue intersection (1)					
LOS	D	E	E	E	D
Avg. Delay (seconds)	52	60	77	77	43
Roadway Safety	Poor	Poor	Poor	Good (2)	Good
Right-of-Way Impacts	Major (1.73 ac)	Moderate (0.97 ac)	Minimal (0.39 ac)	Minimal (0.51 ac)	Moderate (1.01 ac)
Construction Cost (million \$)	Moderate (2.9)	Moderate (1.9)	Moderate (1.5)	Moderate (1.7)	High (5.4)
Ease of Construction	Moderate	Moderate	Simple	Simple	Complex
Traffic Impacts during Construction	Moderate	Moderate	Minimal	Minimal	Major
Business/landowner Acceptance	Poor	Poor	Good	Poor	Poor
Expected Driver Acceptance	Poor	Good	Good	Good	Unknown
Meets design guidelines	Yes	Yes	No	Yes	Yes
Pedestrian benefits	Good	Good	Moderate	Good	Good

Notes:

- (1) Existing: LOS=F, delay=103 sec.; Yr 2035 No-build: LOS=F, delay = 122 seconds
- (2) The safety benefit of a short section of raised median at an intersection is debatable.



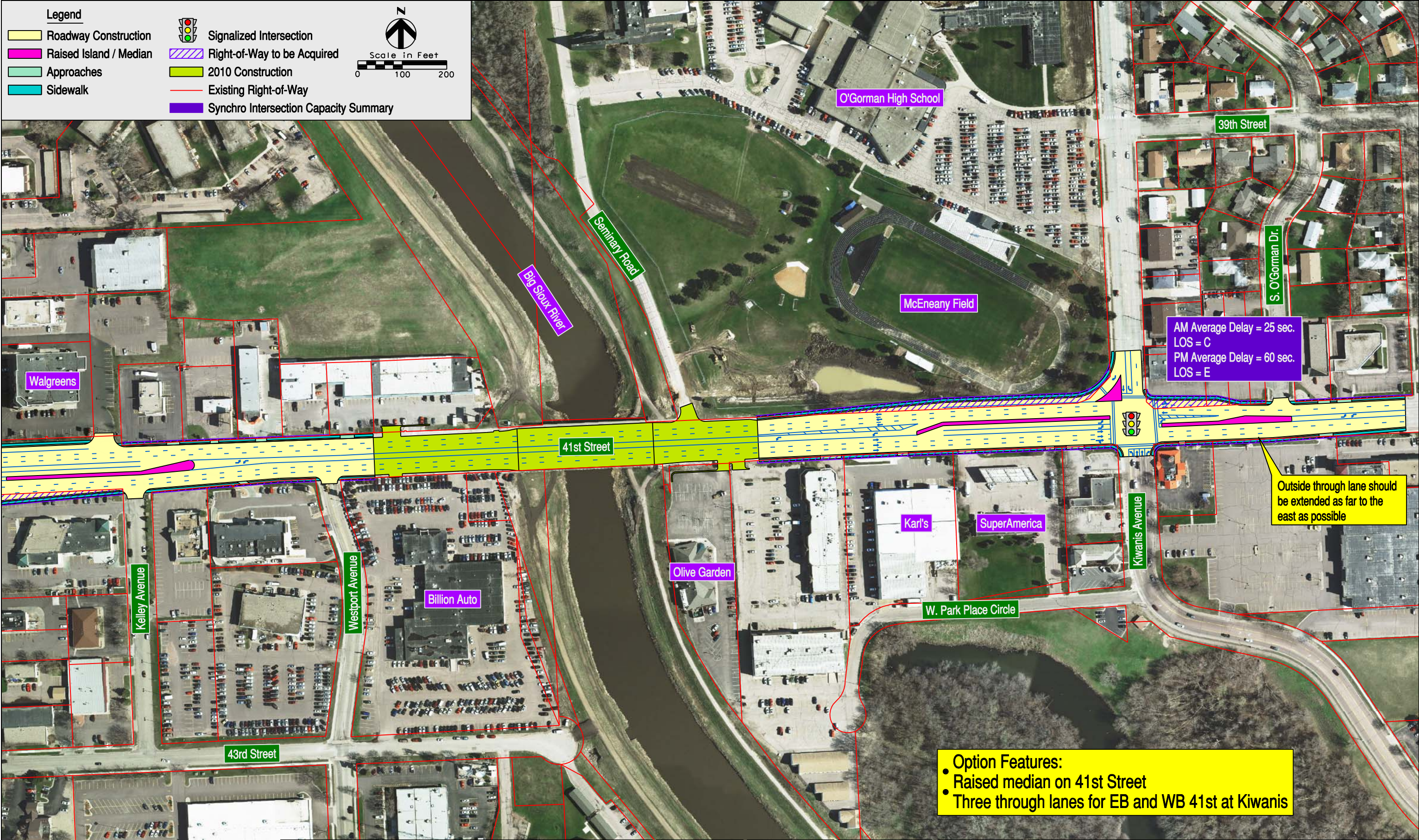
Drawn By: B. Miller
Date: 9-21-2011
Checked By: J. Unruh
Date: 9-21-2011
Revisions: 3-9-2012



41st Street from Louise Avenue to Kiwanis Avenue
Improvement Option A
I-29 Exit 77 (41st Street) Crossroad Corridor Study
Sioux Falls, SD

Figure
6-4A

Date of Aerial Photography: 2008



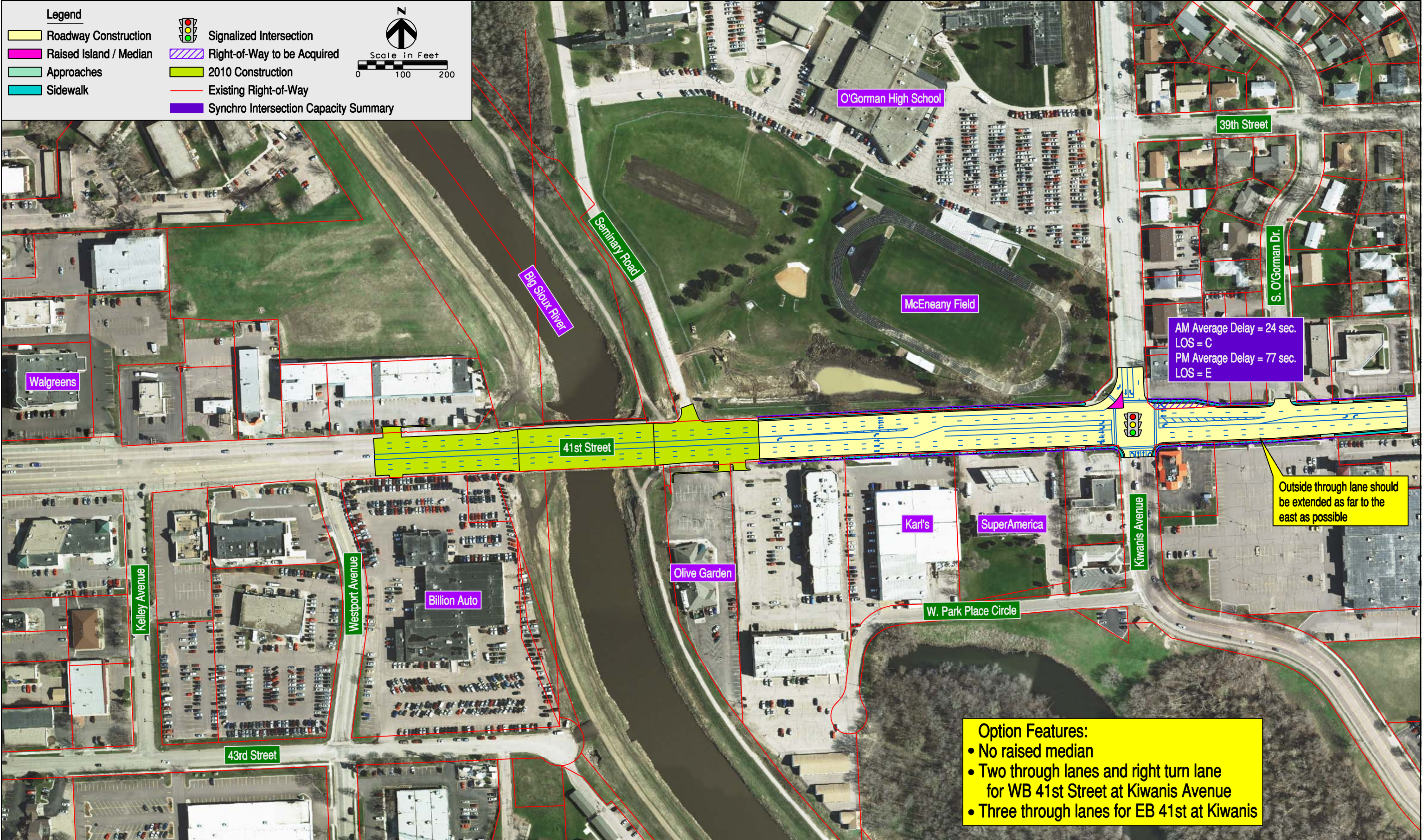
Drawn By: B. Miller
Date: 9-21-2011
Checked By: J. Unruh
Date: 9-21-2011
Revisions: 3-9-2012



41st Street from Louise Avenue to Kiwanis Avenue
Improvement Option B
I-29 Exit 77 (41st Street) Crossroad Corridor Study Sioux Falls, SD

Figure
6-4B

Date of Aerial Photography: 2008



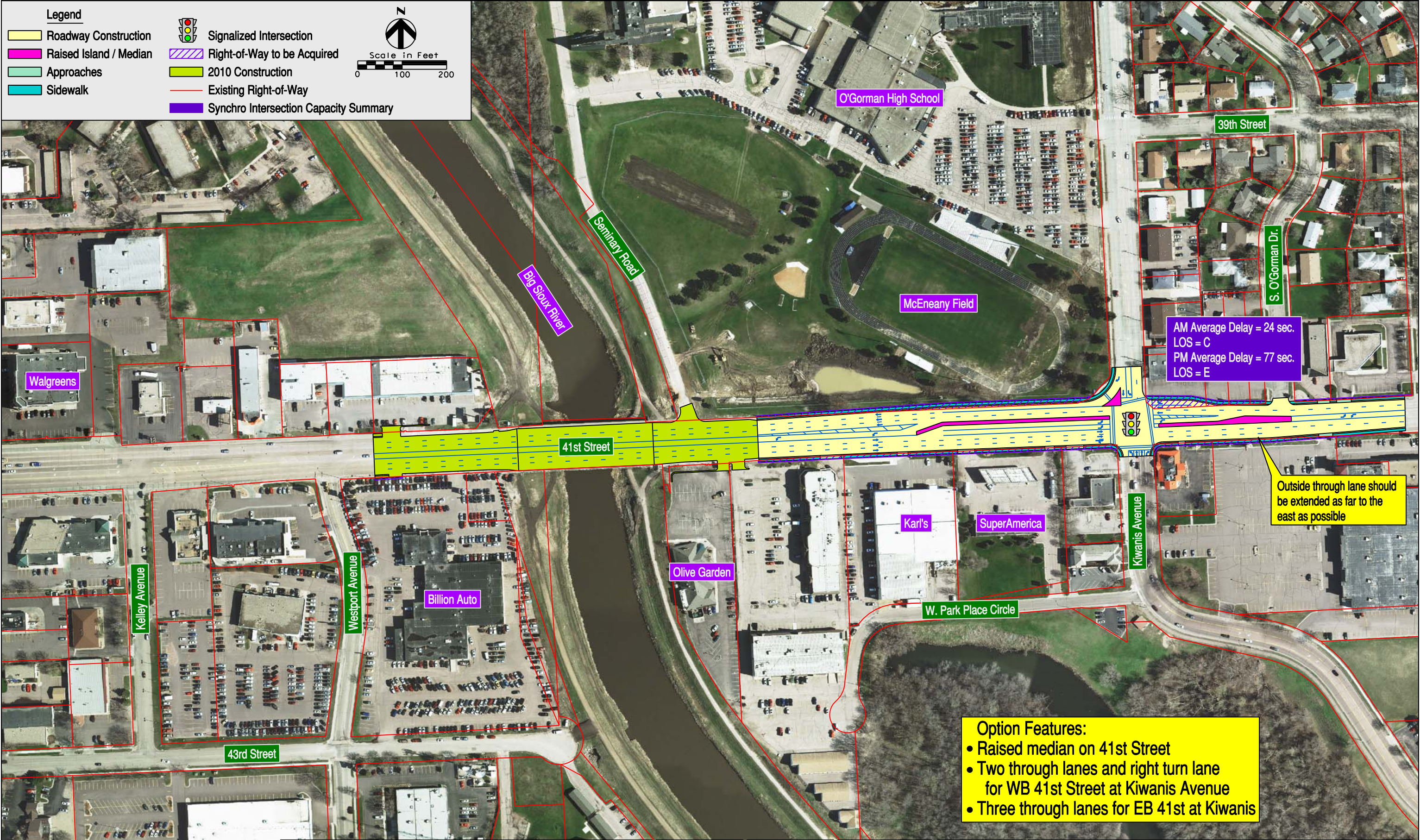
Drawn By: B. Miller
Date: 9-21-2011
Checked By: J. Unruh
Date: 9-21-2011
Revisions: 3-9-2012



41st Street from Louise Avenue to Kiwanis Avenue
Improvement Option C
I-29 Exit 77 (41st Street) Crossroad Corridor Study
Sioux Falls, SD

Figure
6-4C

Date of Aerial Photography: 2008



Drawn By: B. Miller
Date: 9-21-2011
Checked By: J. Unruh
Date: 9-21-2011
Revisions: 3-9-2012



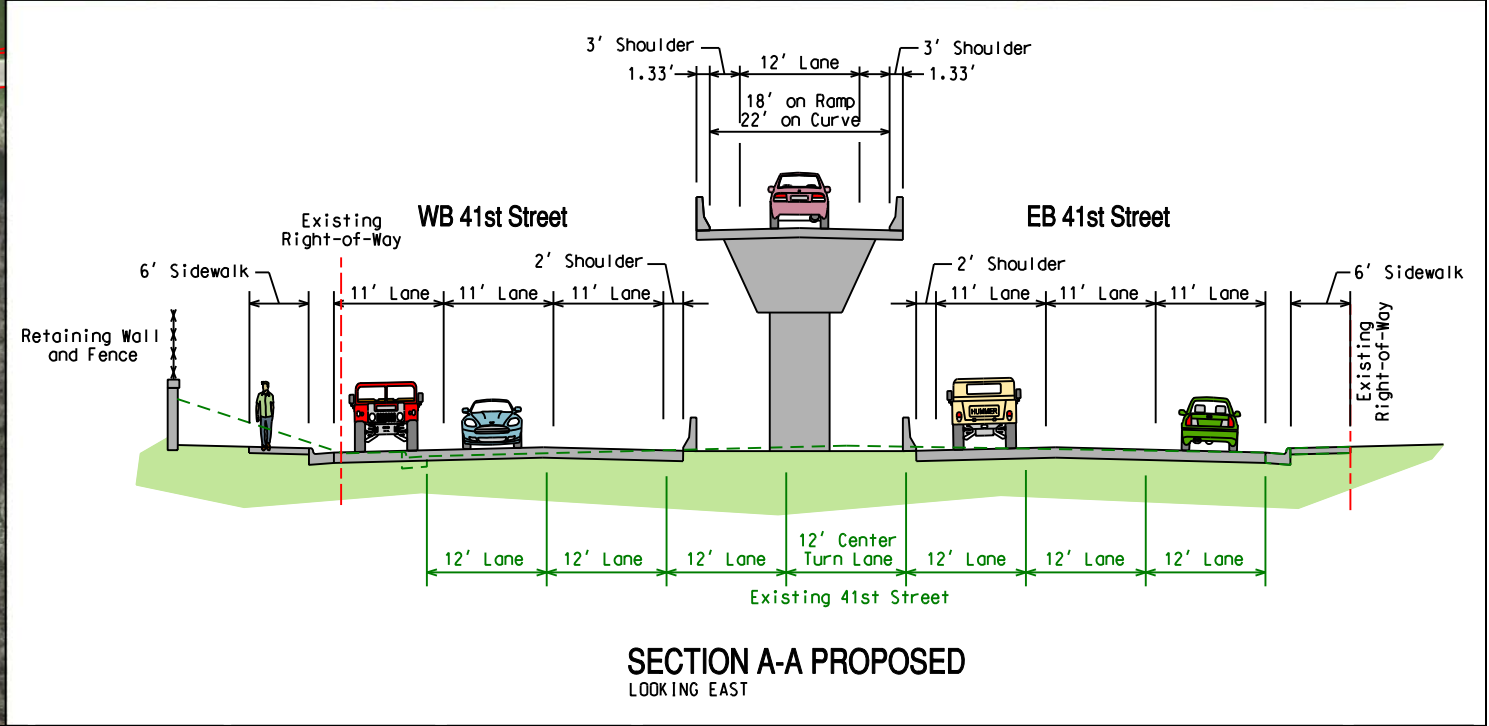
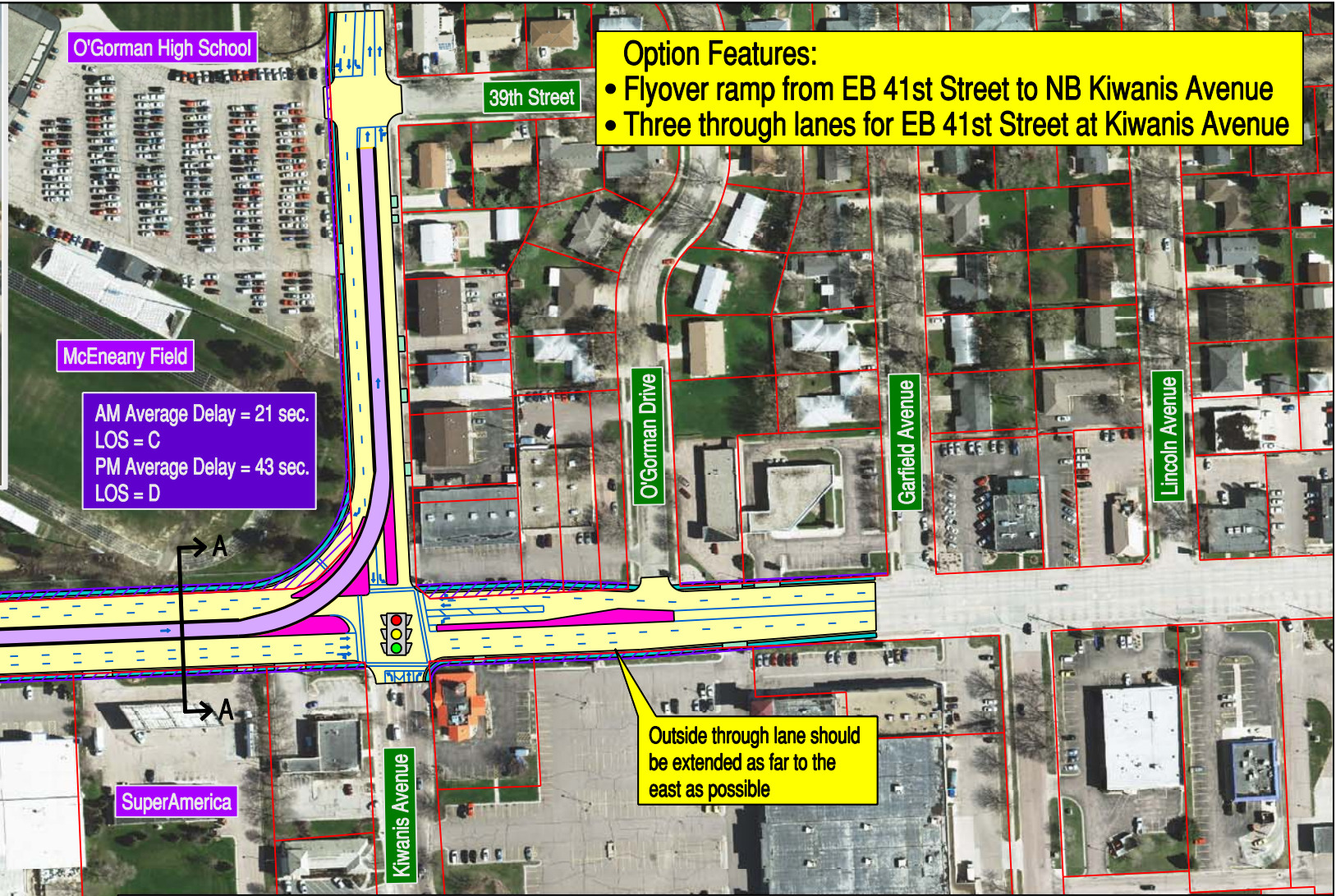
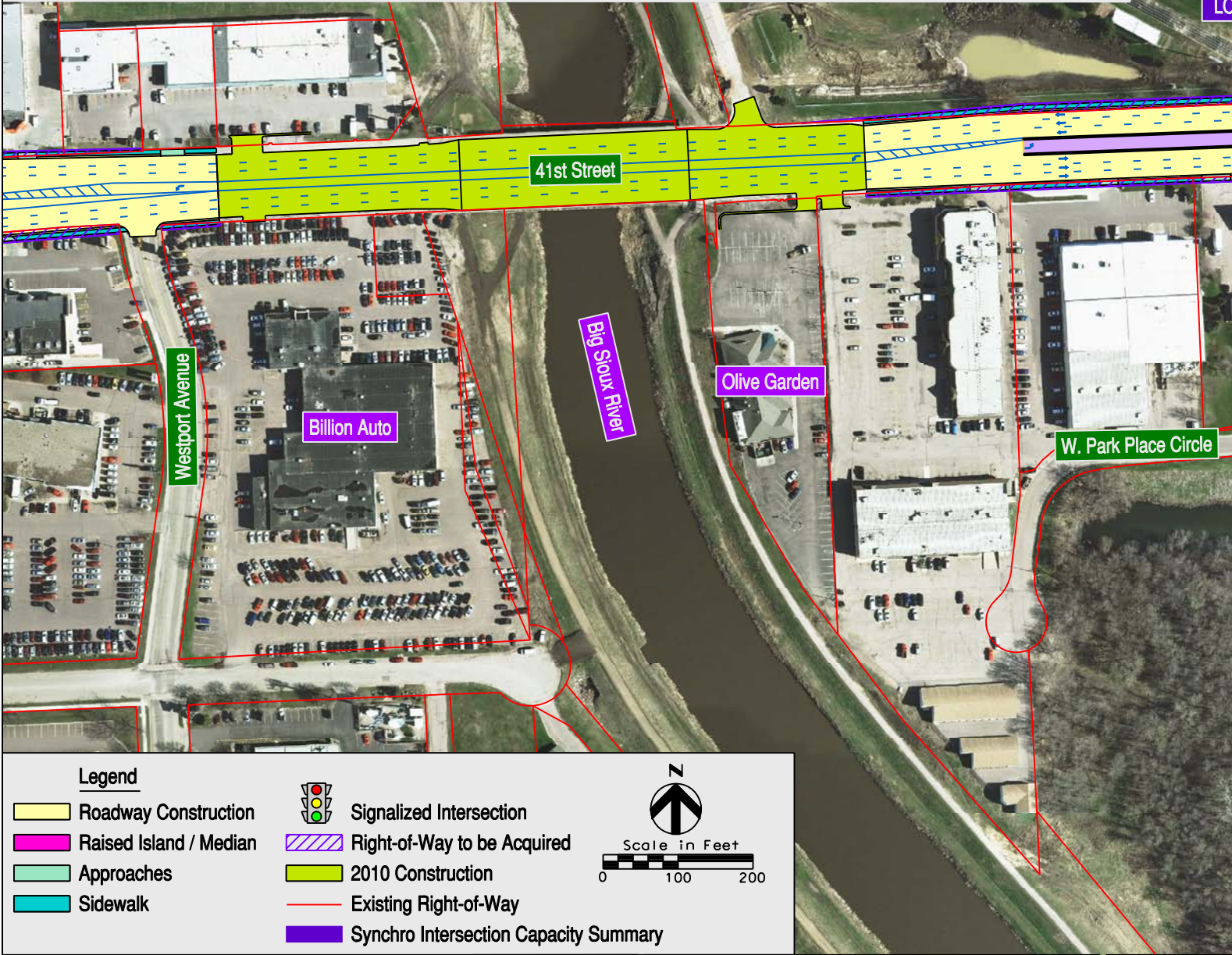
41st Street from Louise Avenue to Kiwanis Avenue
Improvement Option D
I-29 Exit 77 (41st Street) Crossroad Corridor Study
Sioux Falls, SD

Figure
6-4D

Date of Aerial Photography: 2008



Photo of Flyover Ramp in Las Vegas



Segment 5 – Louise Avenue from 49th Street to 41st Street (Figures 6-5)

Existing Conditions

As shown on Figure 6-5, existing Louise Avenue is 2 lanes in each direction from 49th Street to 41st Street with a center two-way left turn lane.

Commercial properties line both sides of Louise Avenue except for an apartment complex on the northeast corner of 49th and Louise. There is a signalized intersection at 49th Street and at the entrance to the Empire Mall and Empire East shopping center. There are several major driveways to the Empire Mall and Empire East.

The existing average daily traffic volume is just under 24,000 vehicles. Traffic generally flows smoothly throughout the day. However, vehicles often have long waiting times to make left turns onto Louise Avenue. During peak shopping periods, vehicles within the Empire East parking lot often block the driveways to Louise Avenue. This is mostly due to the driving lane that is parallel to and very close to Louise Avenue.

The existing sidewalks along Louise Avenue are separated from the roadway by a grassed boulevard which contains some landscape mounds and mature trees.

Year 2035 No-Build Conditions

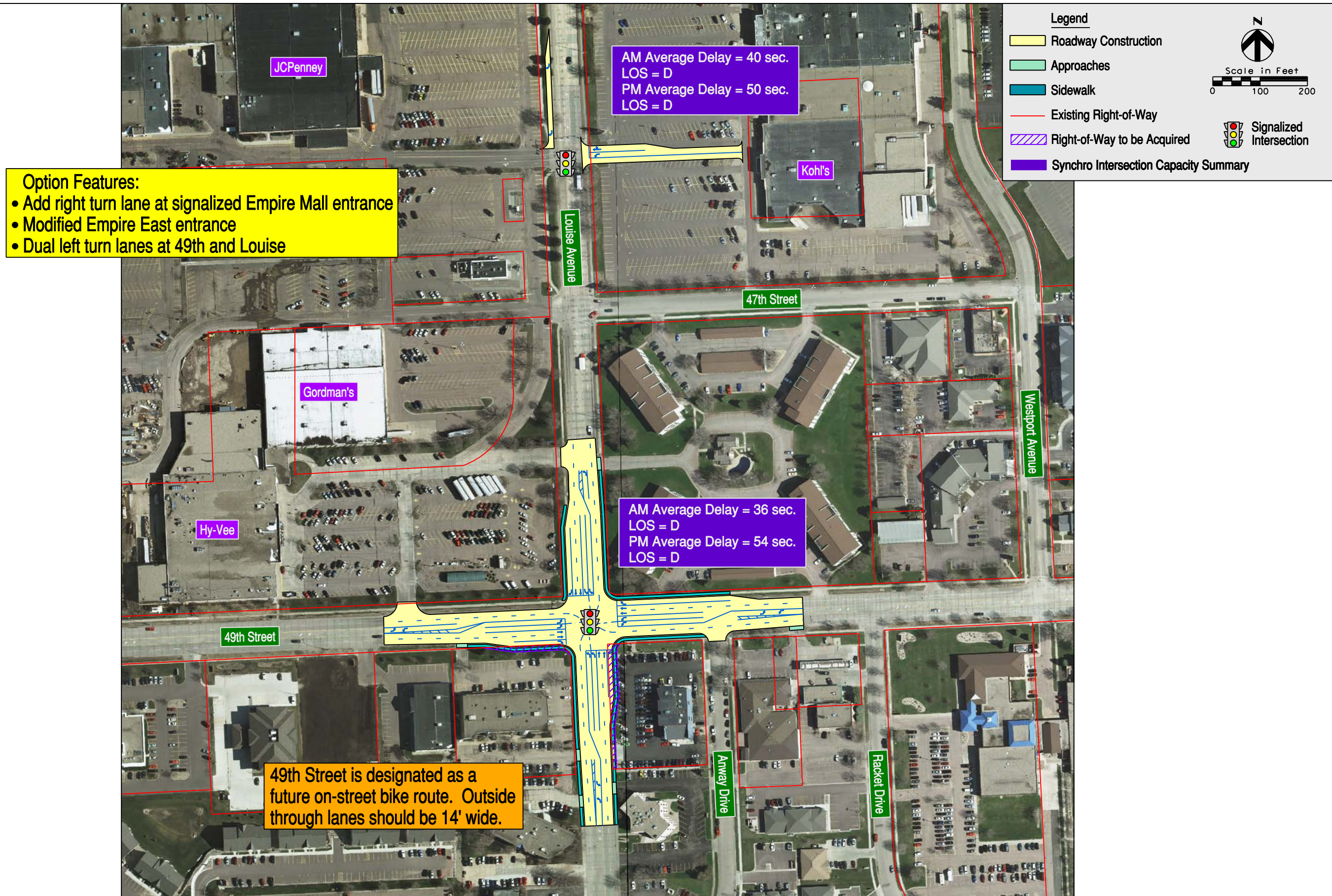
The projected year 2035 average daily traffic volume will be between 25,000 and 28,000 vehicles. The 5 lane section will accommodate the traffic reasonably well except at the 49th Street intersection where the Level of Service will deteriorate from the existing E to F and the average delay will increase from the existing 62 seconds to 107 seconds per vehicle.

Concept Improvement Options (Figure 6-5)

Only one improvement option was developed from Louise Avenue to attain the design goal Level of Service D. Elements of the proposed improvement include:

- Maintain existing 5 lane section north of the 49th Street intersection
- Provide dual left turn lanes at all approaches at the 49th Street intersection
- Provide separated right turn lanes at all approaches at the 49th Street intersection
- Add a southbound right turn lane at the signalized Empire Mall entrance road
- Modify the Empire East access driveway at the signal to reduce the conflict between entering/exiting vehicles, and the vehicles in the driving aisle parallel to Louise Avenue. A similar improvement at the Western Mall entrance at South Holly Avenue has reduced vehicle conflicts and improved traffic circulation.
- Provide 2' to 3' of additional width (14' minimum width) for the outside through traffic lanes to meet the criteria for an on-street bike route in accordance with the most recent MPO bike plan.
- Acquisition of approximately 0.14 acres of additional right-of-way.
- Estimated construction cost of approximately \$1.6 million.

An animation of the 49th and Louise intersection (looking east) with year 2035 PM Peak hour traffic can be viewed at: [Animations\49th and Louise Yr 2035 PM Peak.wmv](#)



Drawn By: B. Miller
Date: 2-6-2012
Checked By: J. Unruh
Date: 2-6-2012
Revisions: 3-9-2012

Segment 6 – Louise Avenue from 41st Street to 34th Street (Figure 6-6)

Existing Conditions

Louise Avenue is 2 lanes in each direction from 41st Street to 34th Street with two left turn lanes at 41st Street and a single left turn lane between West Kentucky Place and 34th Street.

Commercial properties line both sides of Louise Avenue except for some apartment complexes on the east side of Louise. There is a signalized intersection at the Walmart entrance. There is also a short section of raised center median south of the Walmart entrance.

The existing average daily traffic volume is just under 25,000 vehicles. This section of Louise Avenue consistently experiences the most severe traffic congestion in Sioux Falls, mainly due to the high volume of traffic to and from the Walmart store and the high volume of traffic making left turns from southbound Louise to eastbound 41st Street. Left turns onto Louise Avenue are virtually impossible at any time during the day. Traffic entering the Walmart site frequently backs up onto Louise Avenue. At the business/landowner group meetings, the managers of the apartment complexes stated that the traffic problems on Louise Avenue negatively affect apartment occupancy rates.

The existing sidewalks along Louise Avenue are at back of curb. There are no sidewalks going into the properties from Louise Avenue. This is especially problematic at the Walmart entrance where pedestrians have to walk on the driveway to get to the store entrance. (See section 8.0.)

Year 2035 No-Build Conditions

The projected year 2035 average daily traffic volume will be just over 27,000 vehicles. The Level of Service at the Walmart entrance signal will deteriorate from the existing C to E in year 2035. North of the Walmart entrance, the existing Louise Avenue configuration is adequate. Between 41st Street and the Walmart entrance, traffic congestion will continue to deteriorate even with small increases in traffic volume.

Concept Improvement Options (Figure 6-6)

Two options were developed for this segment. One of the options is intended for application with 41st Street/Louise Avenue options C and D; the other option is intended for application with 41st Street/Louise Avenue options A, B, and E. Both options entail relocation of the south entrance to the Walmart site. The intent of this relocation is to provide a better back access connection to the Walmart site and the businesses along the north side of 41st Street between Louise Avenue and Shirley Avenue. Any traffic that can be diverted from Louise Avenue to Shirley Avenue will decrease the congestion on Louise Avenue.

Option C/D – Additional Walmart Entrance at Parking Lot Center (Figure 6-6)

This option features:

- A single northbound left turn lane at the Walmart entrance signal, the same configuration as exists today
- An additional entrance to the Walmart site at approximately the middle of the Walmart parking area

An animation of this option showing Louise Avenue from 41st Street to the Walmart entrance with year 2035 PM Peak hour traffic can be viewed at: [Animations\Options C and D Louise from 41st to Walmart Yr 2035 PM Peak.wmv](#). The estimated construction cost of this option is \$0.4 million.

Benefits of this option include:

1. Traffic flow entering Walmart site will be split between two entrances thereby reducing the internal parking lot congestion that causes traffic to back up onto Louise Avenue.
2. The second entrance from Louise Avenue will provide an alternative to drivers trying to get into the Walmart site.

Drawbacks of this option include:

1. Traffic analysis showed that not enough of the vehicles are drawn away from the signalized intersection to allow for significantly improved Level of Service at the signalized Walmart entrance.
2. This option would not comply with City access spacing standards.
3. Additional weaving problems on Louise Avenue would be anticipated.
4. During peak traffic periods, the southbound vehicles on Louise Avenue will periodically block the middle Walmart entrance.
5. This option does not specifically address the lack of sidewalk leading into the Walmart site.

Option A/B/E – Dual Left Turn Lanes to Walmart Entrance with Site Improvements (Figure 6-6)

This option features:

- Dual northbound left turn lanes at the Walmart entrance signal
- Site improvements to reduce congestion at the main Walmart entrance driveway.

Benefits of this option include:

1. Dual left turn lanes will improve operation of the Walmart entrance intersection.
2. Site improvements should allow for less driver confusion and better traffic circulation within the Walmart site.
3. Modification of the site entrance should include the addition of sidewalk from Louise Avenue to the store entrance. This is shown on the Option E layout.
4. Better intersection operation would improve access to the Bridgewood Estates apartment complex on the east side of Louise Avenue.

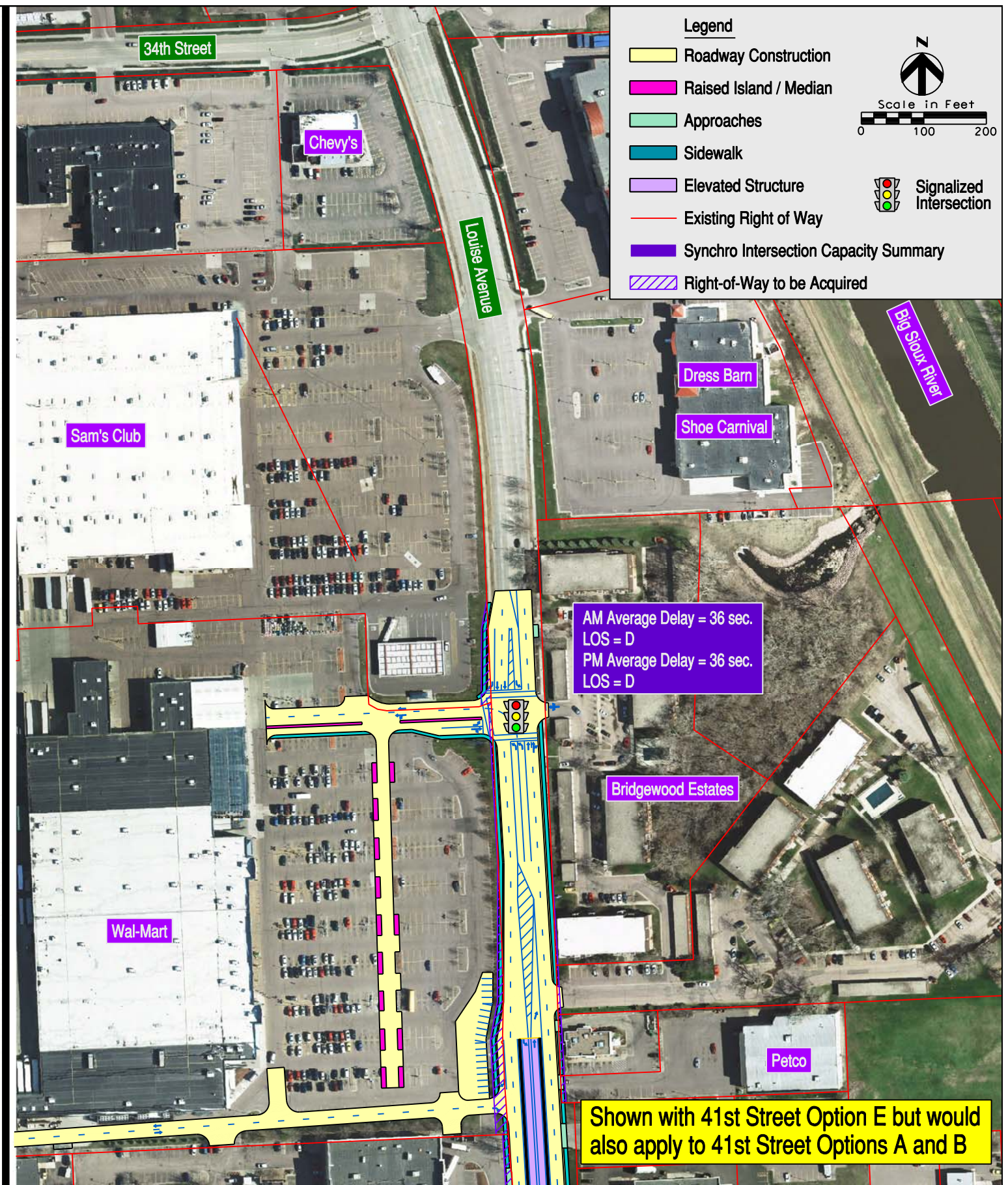
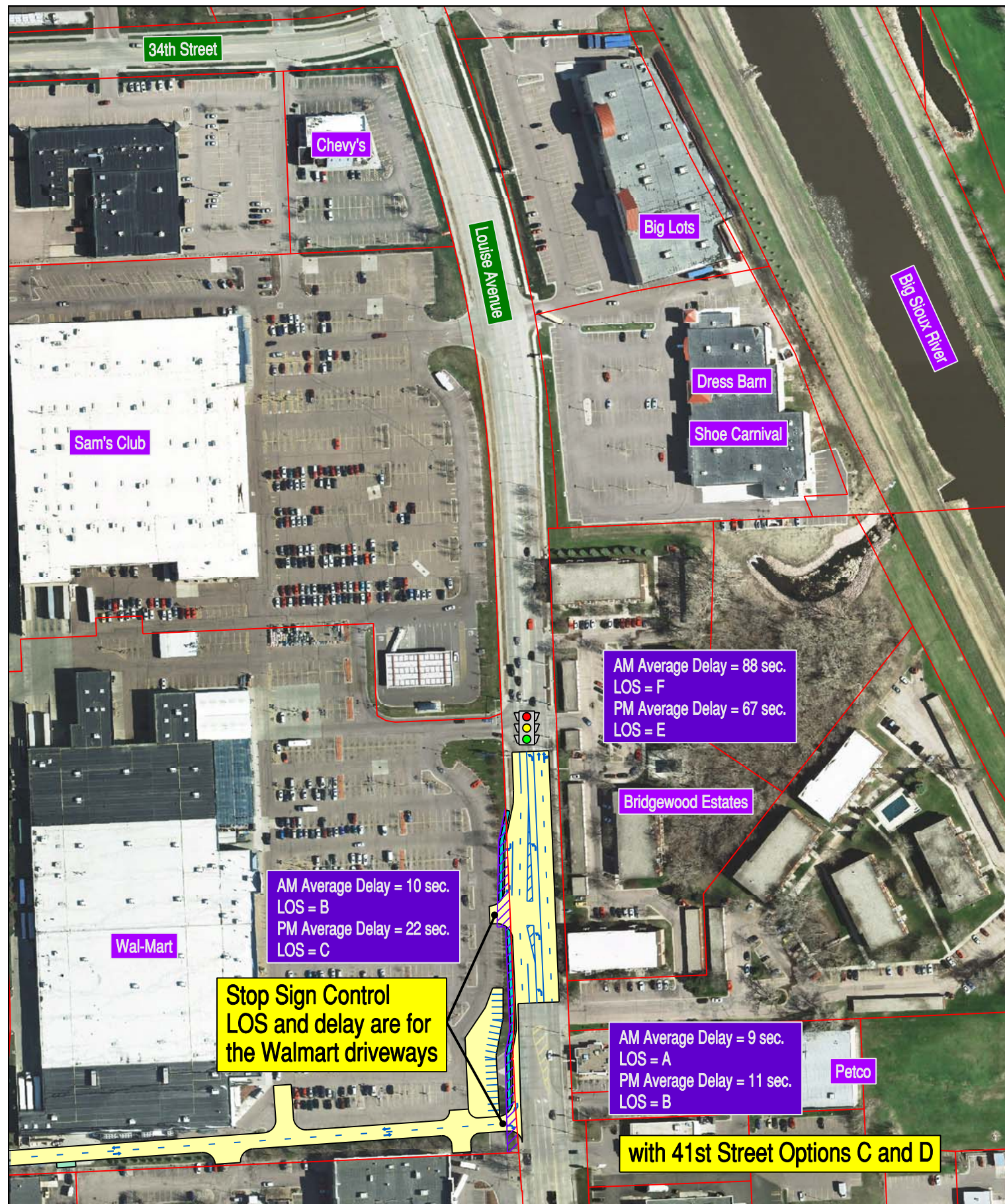
Drawbacks of this option include:

1. This option is totally dependent on the cooperation of Walmart.

An animation of this option showing Louise Avenue from 41st Street to the Walmart entrance with year 2035 PM Peak hour traffic can be viewed at: [Animations\Option E Louise from 41st to Walmart Yr 2035 PM Peak.wmv](#). The estimated construction cost of this option is \$0.8 million.

Consultant Recommended Option

HDR recommends the dual left turn lane into the Walmart site. This option does improve operation at the intersection. However, implementation of this option is contingent on cooperation of the business owner.



7.0 Public Involvement

The general public and public agencies were involved throughout the study process, with public meetings, landowner meetings, a website, and other techniques. These techniques are enumerated below:

- Public meetings – Public meetings were held in April and September, 2011. The April meeting introduced the project and sought initial public input on transportation problems and needs within the study area. The September meeting provided a spectrum of improvement alternatives and received public input on the quality and public acceptance of the alternatives. An additional public meeting was held in March, 2012 to solicit input on the study recommendations.
- Study Advisory Team – The Study Advisory Team, comprised of representatives of the Federal Highway Administration, South Dakota Department of Transportation, City of Sioux Falls, and the Sioux Falls Metropolitan Planning Organization, met periodically during the study to guide the study process and provide agency input.
- Business/Landowner Group Meetings – Business/landowner group meetings were held in April and September, 2011. Both sets of meetings were designed to allow landowners within the study area to discuss specific issues regarding their properties with study staff.
- Individual Landowner Meetings – Several meetings were held with individual landowners where specific improvement options, and the associated impacts of those options, were discussed.
- Website – A study website was maintained by the South Dakota Department of Transportation and provided easy access to information and documents prepared as part of the study. The website address was: <http://sddot.com/transportation/highways/planning/specialstudies/i29exit77/default.aspx>
- The link to the study website was provided from the MPO website as well.
- Metropolitan Planning Organization (MPO) – Project updates were presented to the Citizens Advisory Committee (CAC), Technical Advisory Committee (TAC), Urbanized Development Commission (UDC) at their August and September 2011 and March 2012 meetings.

Documentation of the public involvement aspect of the project is provided in Appendix B. The handouts, displays, comments, presentations, meeting notes, etc are included in the appendix.

Public Meetings (Figure 7-1)

- April 12, 2011 meeting at JFK Elementary School Gymnasium – Notice of the meeting included:
- 361 letter invitations were sent to all of the property owners within the areas identified in Figure 7-1.
 - Notices were placed in the Sioux Falls Argus Leader on March 26 and April 2.
 - SDDOT and the City of Sioux Falls issued press releases.
 - Local media stations carried an announcement on 4/11/11
 - MPO emailed notifications to those on their interested parties list, including members of the MPO’s CAC, TAC, and UDC.

The documented attendance at the meeting was 39.

- September 21, 2011 meeting at JFK Elementary School Gymnasium – Notice of the meeting included:
- 424 letter invitations were sent to all of the property owners within the areas identified in Figure 7-1.
 - 42 invitation follow-up calls were made to property owners along the roadway corridors who did not attend the April meeting.

- Notices were placed in the Sioux Falls Argus Leader on September 4 and 11.
- SDDOT and the City of Sioux Falls issued press releases.
- Local media stations carried an announcement on 9/21/11.
- MPO emailed notifications to those on their interested parties list, including members of the MPO’s CAC, TAC, and UDC.
- 2 flashing message signs were placed along 41st Street within one week of the meeting.

The documented attendance at the meeting was 55.

In general, feedback from the public meetings indicated:

- Support for the Diverging Diamond Interchange at 41st/I-29
- Consensus that traffic conditions on 41st Street are poor and that improvements are needed
- Support for a raised median on 41st Street by home owners and commuters
- Opposition to a raised median on 41st Street by business owners

- March 14, 2012 meeting at JFK Elementary School Gymnasium – Notice of the meeting included:
- 413 letter invitations were sent to all of the property owners within the areas identified in Figure 7-1. (Duplicate mailings to owners of multiple properties were eliminated from the previous mailing list.)
 - Notices were placed in the Sioux Falls Argus Leader on February 26 and March 2.
 - SDDOT and the City of Sioux Falls issued press releases.
 - Local media stations carried an announcement on 3/14/12.
 - MPO emailed notifications to those on their interested parties list, including members of the MPO’s CAC, TAC, and UDC.
 - 2 flashing message signs were placed along 41st Street within one week of the meeting.

The documented attendance at the meeting was 62.

In general, feedback from the public meetings indicated:

- Support for the Diverging Diamond Interchange at 41st/I-29
- Support for the Center Turn Overpass at 41st/Louise and for the flyover ramp at 41st/Kiwanis.
- Opposition to a raised median on 41st Street by business owners.
- Support for right-in/right-out option at Carolyn Avenue with realignment of Carolyn Avenue and a back access through the Rodeway Inn. **(Prior to final printing of this report, the name of the Rodeway Inn was changed to RedRock Inn. To minimize confusion with previous documents, the Rodeway Inn designation was maintained throughout this final printing.)**
- Concern that the implementation timeframe for the various projects could not be more certain.

Business/Landowner Meetings (Figure 7-2)

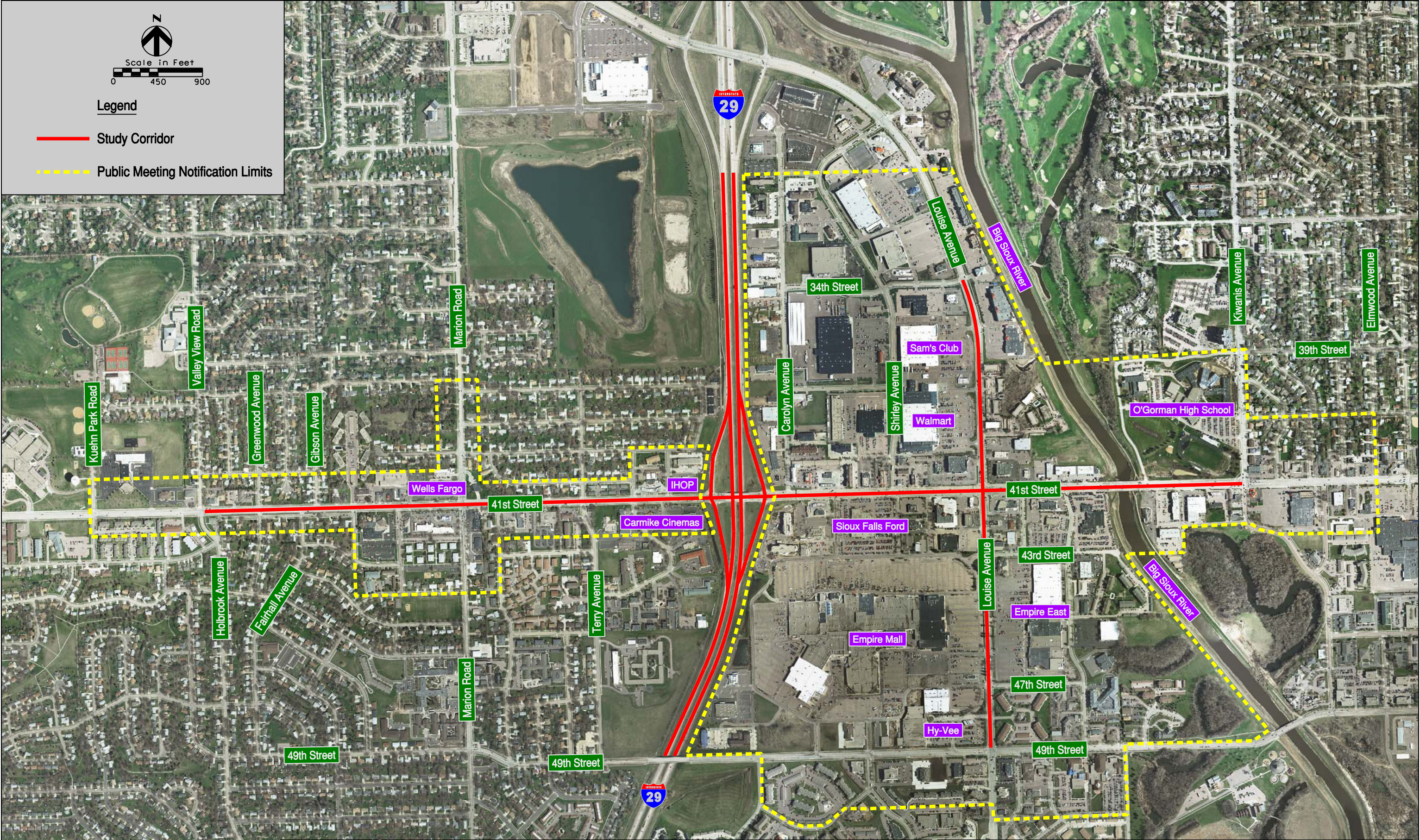
These meetings gathered a group of business/landowners that have a common area of interest in the project. As shown in Figure 7-2, the 41st Street and Louise Avenue corridors were divided into six separate areas. Two sets of meetings were held with each of the business/landowner groups. The smaller group size and the focus on a specific area of the project resulted in productive and candid discussion about the problems along the corridor roadways and potential solutions to those problems.

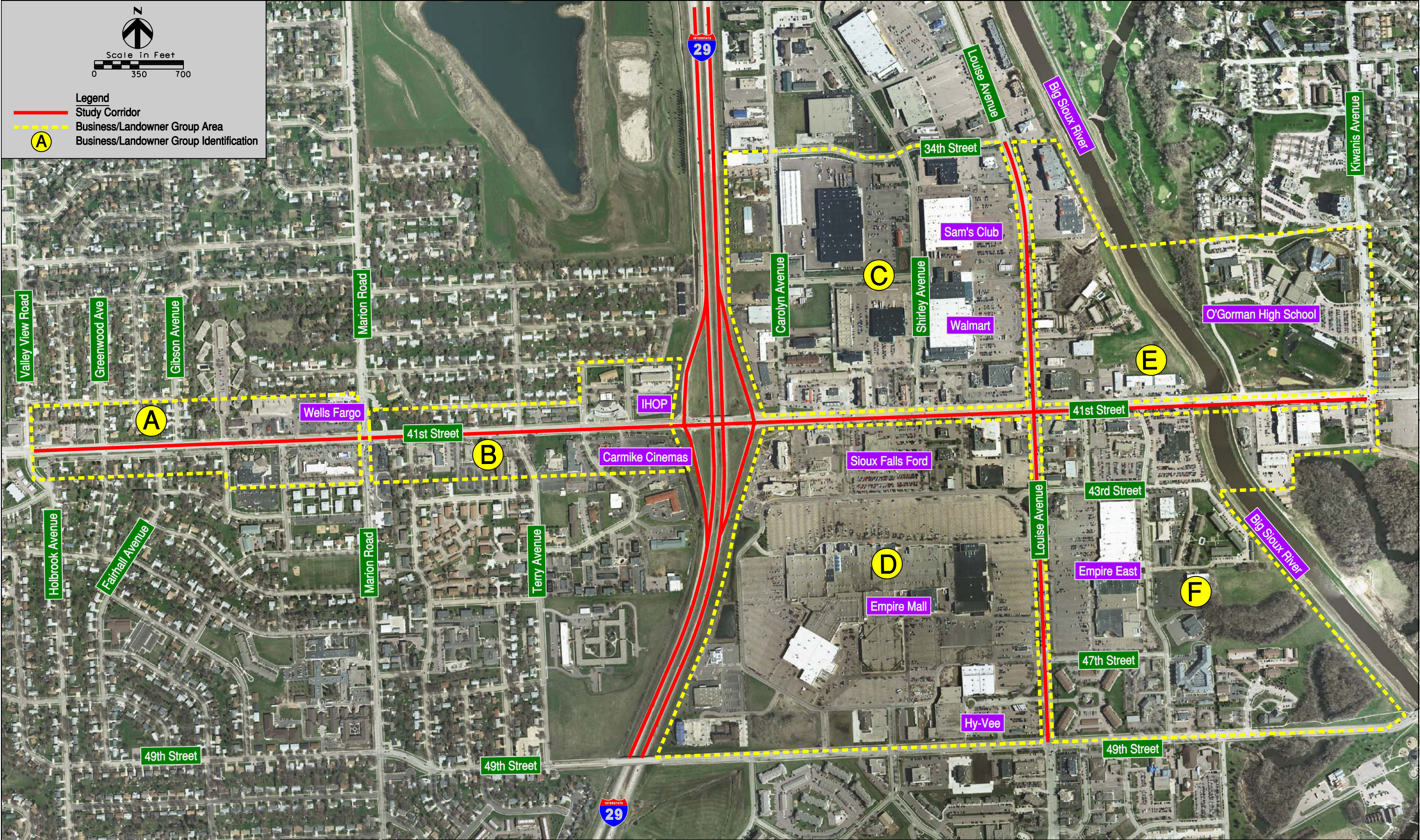
April 18 and 20, 2011 meetings at Kuehn Community Center – Notice of the meetings included 221 letter invitations (see Figure 7-2). The documented attendance at the meetings was 41.

September 27 and 28, 2011 meetings at Kuehn Community Center – Notice of the meetings included 288 letter invitations (see Figure 7-2). Invitation follow-up calls were made to 42 property owners along the roadway corridors who did not attend the April meetings. The documented attendance at the meetings was 31.

In general, feedback from the business/landowner meetings indicated:

- With the high traffic volumes along 41st Street and Louise Avenue, access into and out of many properties is difficult and dangerous during peak traffic periods. This was particularly the case at the apartment complexes that are adjacent to 41st Street and Louise Avenue.
- Business owners were generally opposed to a raised median along 41st Street because of the associated restriction in left turn movements.
- Business owners were generally opposed to any widening of 41st Street or Louise Avenue that would include property acquisition.





Date of Aerial Photography: 2008

Drawn By: B. Miller
Date: 2-7-2012
Checked By: J. Unruh
Date: 2-7-2012
Revisions:



Business / Landowner Group Areas

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
7-2

8.0 Pedestrian, Bicycle, and Transit Considerations

Existing Conditions (Figure 8-1)

Pedestrian facilities – Sidewalks line both sides of 41st Street and Louise Avenue throughout the Study Area. Pedestrian counts on corridor sidewalks are shown on Figure 8-1. Specific sidewalk configurations include:

- **41st Street west of I-29** – Sidewalks are separated from 41st Street by a grassed boulevard as shown in the photo below. Multiple disadvantaged, handicapped, and assisted living facilities exist within 3 blocks of I-29 in this area. At the business/landowner group meetings, one concern was that residents with walkers and motorized wheel chairs have difficulty crossing 41st Street because of the lack of ADA compliant ramps at intersections, especially Terry Avenue and Marion Road.



Photo shows sidewalk along 41st Street west of I-29.

- **41st Street at I-29** – The existing bridge provides back-of-curb sidewalk on both sides of 41st Street with concrete barrier separating the traffic lanes from the sidewalk on the bridge structure. The ramp intersections do not have ADA compliant ramps or well defined pedestrian crosswalks. The high vehicular turning volumes at the ramps tend to discourage pedestrian traffic

Photo shows sidewalk along 41st Street at the I-29 bridge.



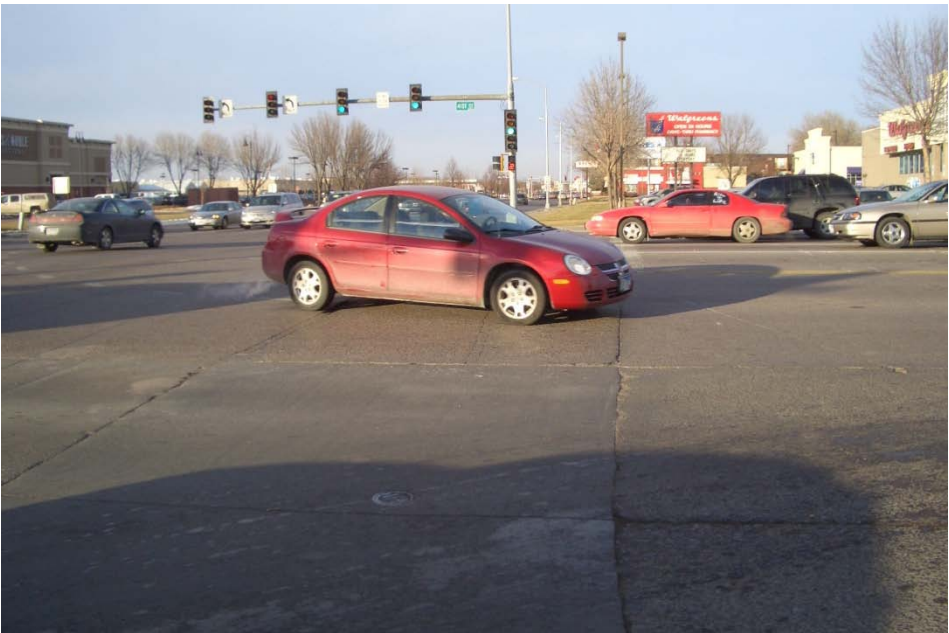
- **41st Street east of I-29** – Sidewalks are at back of curb as shown in the photo below. The close proximity and high volume of traffic on 41st Street tend to discourage pedestrian traffic. In addition, the Empire Mall entrance roadways do not have adjacent sidewalks.



Photo shows sidewalk along 41st Street east of I-29.

- **41st Street/Louise Avenue intersection** – The long crossing distances at this intersection (9 lanes on the east leg) tend to discourage pedestrian traffic. Each time the pedestrian crossing signal is actuated, the signal progression timings on 41st Street are disrupted. The signal must run through several cycles after the pedestrian actuation to get progression timings back in sync.

The existing pedestrian crossing of 41st Street at Louise Avenue provides countdown pedestrian timers.



- **Louise Avenue** – The sidewalk along Louise Avenue is generally separated from the roadway by a grassed boulevard. Near 41st Street, the sidewalk is at back of curb. The main detriment for pedestrians along Louise Avenue is the lack of sidewalks going into the businesses.



Photo shows sidewalk with boulevard along Louise Avenue.

Bicycle facilities – Neither 41st Street nor Louise Avenue are designated for bicycle use. As shown in Figure 8-1, designated bicycle facilities cross 41st Street at two locations:

- Marion Road is currently designated as an on-street bike route. 49th Street is designated as a future on-street bike route. Within the Study Area Limits, there are no specific features such as widened outside lanes that are conducive to bicycle use.
- The Big Sioux River Greenway Bike Trail crosses under 41st Street at the Big Sioux River bridge. Reconstruction of the bridge in 2010 as part of a flood control project included ADA compliant connections from the sidewalk along 41st Street to the trail.

Transit facilities – Figure 8-1 shows the transit routes and stops along 41st Street and Louise Avenue within the Study Area. The types of land use along 41st Street and Louise Avenue are conducive to a relatively high usage of the transit facilities. However, due to right-of-way restrictions, there are no bus pull-outs and few shelters and benches. When a bus stops at a transit stop along 41st Street or Louise Avenue, drivers behind the bus either pull out into the adjacent lane to go around the bus or they wait for the bus to pick up or drop off the riders. There is no crash data to suggest that existing transit stops have resulted in increased crash rates. It was pointed out at the business/landowner group meetings that the bus stops along Marion Road cause traffic backups because Marion Road provides only a single through lane. This is especially a problem for the bus stop south of 41st Street.

Photo shows pedestrian shelter along Louise Avenue.



Photo shows wheel chair user on Walmart driveway.



Pedestrian, Bicycle, and Transit Considerations Improvement Options

Pedestrian facilities – All of the interchange and corridor concept options show pedestrian features such as sidewalks and intersections crossing features. Specific aspects of these improvements include:

- Due to right-of-way restrictions, sidewalk will need to be at back of curb along 41st Street. Sidewalk width should be a minimum 6 feet and all ADA criteria should be adhered to.
- All intersection crossings should be ADA compliant and signals should be designed to accommodate pedestrian crossings.
- Corridor concept options with raised median should be given strong consideration because the center raised median can provide a pedestrian refuge.
- The Diverging Diamond Interchange should provide a protected pedestrian route along the center of the bridge as shown in Figure 5-3. This type of configuration has been conducive to pedestrian use on other DDI installations in the United States.
- Any redevelopment plans for adjacent properties should include sidewalks from 41st Street to the entrance to the site building(s). At many locations (such as the Empire Mall and Walmart), sidewalks could be constructed along the existing entrance roadways. Improvement option 6E (Figure 6-6) shows new sidewalk along the modified Walmart entrance driveway.

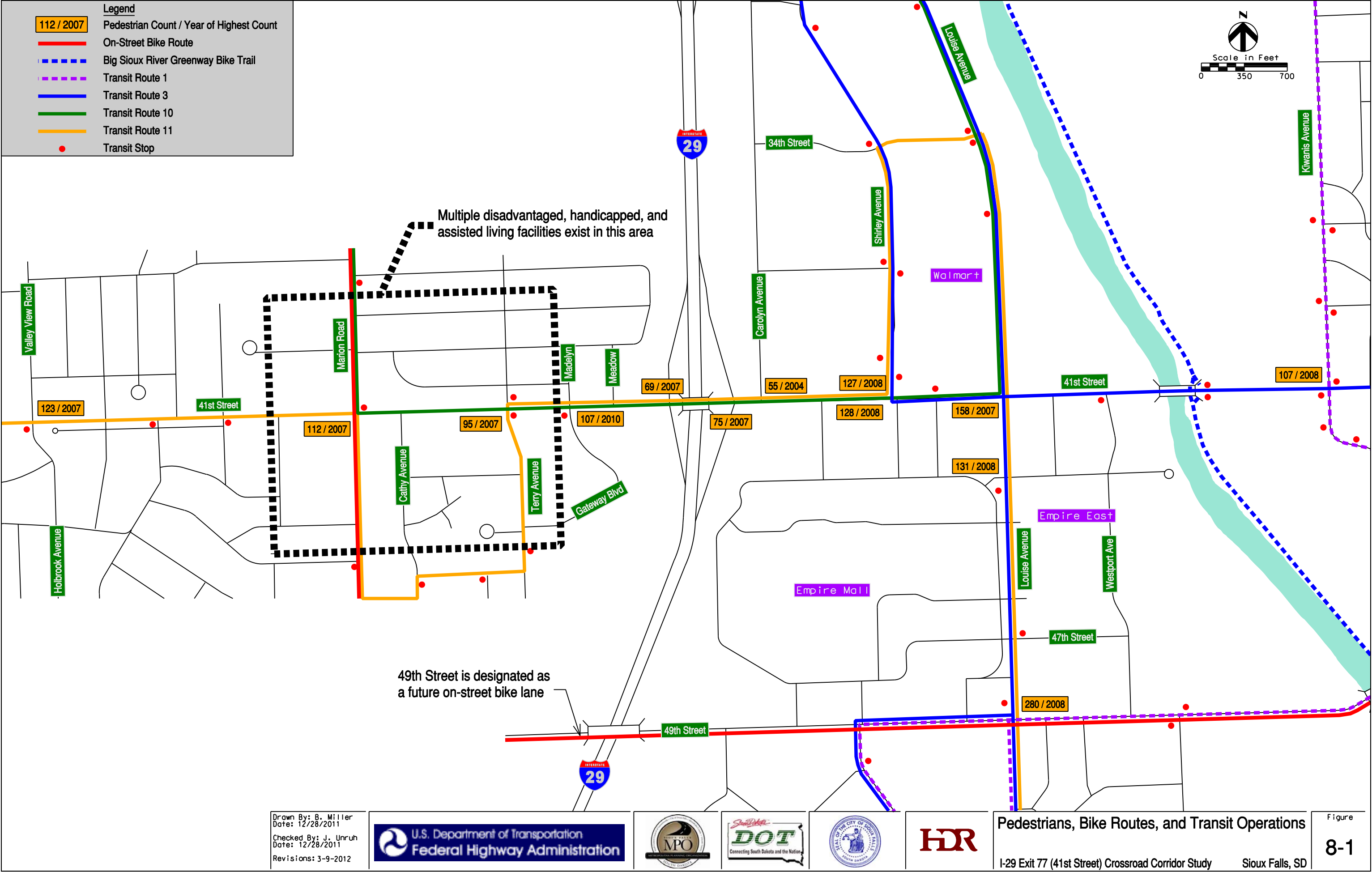
Bicycle facilities – Special accommodation for bicycles along 41st Street and Louise Avenue is not proposed due to:

- Limited available right-of-way for widened outside traffic lanes
- High traffic volumes

Marion Road and 49th Street improvements should include widening of the outside through traffic lane in each direction to allow for bicycle use in accordance with the City's On-Street Bike Route designation. The City of Sioux Falls Bicycle Plan recommends at least 14 foot wide lanes (as measured from the lane stripe to the edge of the gutter pan) with a desirable 15 foot width for arterial streets with average daily traffic exceeding 10,000.

Transit facilities – No specific transit facility improvements have been shown on the concept improvement options. Improvements that increase capacity will help diminish the disruption that transit stops have on traffic. Widening of Marion Road to 2 through lanes will especially reduce traffic back ups that are associated with the existing transit stops. General improvements that should be considered during design of improvements should include:

- Provide bus pull-outs where right-of-way can be acquired and use of pull-out is not blocked by traffic queues.
- Provide shelters and benches where feasible and where right-of-way is available or can be acquired.
- Coordinate design improvements with Sioux Area Metro.



Drawn By: B. Miller
Date: 12/28/2011
Checked By: J. Unruh
Date: 12/28/2011
Revisions: 3-9-2012



Pedestrians, Bike Routes, and Transit Operations

I-29 Exit 77 (41st Street) Crossroad Corridor Study

Sioux Falls, SD

Figure
8-1

9.0 Consultant Recommended Improvement Options Summary

The following list of consultant recommended improvement options for the 41st Street corridor was developed in consultation with the Study Advisory Team. The list is based on analysis of transportation needs, potential costs, and public input.

Segment 1 – 41st Street from Valley View Road to Marion Road

- Option B – Widen 41st Street to 3 lanes in each direction with raised median and ¾ movement configuration at Lewis Drug.

Marion Road

- Widen Marion Road to 2 lanes in each direction with no raised median.
- Provide dual left turn lanes at all 41st Street/Marion Road intersection approaches.
- Provide single right turn lane at west, north and east approaches and dual right turn lanes at the south approach at the 41st Street/Marion Road intersection.

Segment 2 – 41st Street from Marion Road to I-29

- Option B - Widen 41st Street to 3 lanes in each direction with raised median and ¾ movement configuration at Gateway Boulevard.

I-29 Interchange

- Reconstruct interchange to Diverging Diamond configuration
- Close Carolyn Avenue at 41st Street and provide a back access connection from Shirley Avenue to Carolyn Avenue through the Rodeway Inn site (Carolyn Avenue Option 5).

Segment 3 – 41st Street from I-29 to Louise Avenue

- Option D – Add raised median to Shirley Avenue with ¾ movement configuration at West Empire Place and one-way Empire Mall entrance roadways. Expand this option to include Center Turn Overpass at Louise Avenue (Option E) if:
 - Funding becomes available (Demonstration project funding may be available for this type of project.)
 - The Center Turn Overpass concept is successfully implemented in a similar setting elsewhere.

Segment 4 – 41st Street from Louise Avenue to Kiwanis Avenue

- Option C – Maintain dual left turn lanes for eastbound 41st to northbound Kiwanis with no raised median. Extend 3rd eastbound through lane east of Kiwanis to eliminate “trap lane”.

Segment 5 – Louise Avenue from 49th Street to 41st Street

1. Expand 49th/Louise intersection to dual left turn lanes and single right turn lanes at all approaches.

Segment 6 – Louise Avenue from 41st Street to 34th Street

2. Option E – Provide dual left turn lanes on northbound Louise at Walmart signal with internal Walmart site circulation improvements.

10.0 Implementation Timeframe and Anticipated Funding Responsibility

A consideration for this corridor study is the potential timeframe of any improvements to accommodate the associated need for the improvements. Funding responsibility is also a major consideration. Figure 9-1 illustrates the anticipated timeframe of and associated funding responsibilities for the various corridor improvements. The timeframes represent a best guess estimation of when traffic conditions will warrant the improvements. Other factors that may affect implementation include roadway condition, funding availability, and political priorities. FHWA has approved the use of \$3 million of Safety Funding to reconstruct the I-29 interchange if safety and pedestrian concerns are adequately addressed.

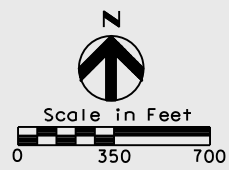
11.0 Summary and Next Steps

The I-29 Exit 77 (41st Street) Corridor Study:

1. Identified existing and future traffic and safety issues and needs on the Study Area roadways.
2. Developed reasonable improvement concept options to address the traffic and safety needs.
3. Identified the benefits and drawbacks of each of the concept options.

These are the anticipated next steps for the projects associated with the I-29 Exit 77 (41st Street) Corridor Study:

1. Refine the implementation timeframe and funding responsibility.
2. Add projects, as necessary, to the MPO fiscally constrained Long Range Transportation Plan.
3. Fund individual projects in the State or City 5-year Improvement Program.
4. Prepare an Interchange Modification Report for the I-29/41st Street interchange.
5. Prepare an environmental document for each project in accordance with National Environmental Policy Act and other applicable federal and state regulations. This step includes further design refinement and in-depth analysis of each option. The No-Build option will be considered as well as all of the options identified in this Corridor Study.
6. Select a preferred option for each project.
7. Acquire right-of-way (where necessary).
8. Complete final design plans.
9. Construct project.



**Implementation Timeframe
Funding Responsibility
(Estimated 2012 Construction Cost in Million \$)**

Note:
Construction cost depends on option.



year 2025 to 2035
City
(4.0 to 4.2)

year 2016 to 2025
City
(1.3 to 1.5)

year 2020 to 2030
City
(1.6 to 1.7)

year 2016 to 2025
City & SDDOT
(7.2 to 7.4)

year 2016 to 2025
City
(1.0 to 3.6)

year 2020 to 2030
City
(1.6)

year 2020 to 2030
City
(0.4 to 13.9)

year 2020 to 2030
City
(1.5 to 5.4)

Options for each project will be reviewed in accordance with the National Environmental Policy Act (NEPA) when funding is allocated for the project via the SDDOT or City of Sioux Falls 5-year Improvement Program.

The NEPA process will identify a “Preferred Option.”

The “No-Build” option and all build options will be considered at that time.

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Appendices:

A – Carolyn Avenue Access Analysis Memoranda

B – Public Involvement

- **April 12, 2011 Public Meeting**
- **April 18 and 20 Business/Landowner Group Meetings**
- **September 21 Public Meeting**
- **September 27 and 28 Business/Landowner Group Meetings**
- **Individual Landowner Meetings**
- **March 14, 2012 Public Meeting**

C – Crash Memo

D – SYNCHRO[®] Signalized Intersection Analysis Printouts